

# Test Report

No. 24-1-0014701T007-TR1-R01

May 28, 2025

Applicant **Abel Sensors**

Product Model **Fill Level Sensor  
RAD-SEN-05**

Test Standard(s) **FCC Title 47 CFR Part 15B (2025-01)  
ICES-003:Issue 7 (2020-10)**

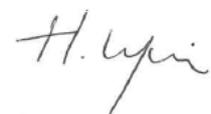
Verdict  **PASS: All applicable Test(s) acc. to the standard(s) are PASS/complies**

The test results relate only to devices specified in this document

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



authorized by **Wolfgang Markus**  
Test Lab Manager  
Electromagnetic Compatibility



created by **Hicham Laayouni**  
Testing Manager  
Electromagnetic Compatibility

## Table of content

1	Disclaimer .....	3
2	Related cetecom advanced documents .....	3
3	Document history .....	4
3.1	Current release.....	4
3.2	Previous releases .....	4
4	Test laboratory .....	4
4.1	Contact information .....	4
4.2	Involved test locations .....	4
4.3	Subcontracted laboratories.....	4
4.4	Laboratory listings and recognitions.....	4
4.5	Common report information.....	4
4.6	Reporting statements of conformity – decision rule .....	5
4.7	Measurement uncertainty.....	6
4.8	Abbreviation and Legend of Measurement Equipment Calibration details .....	6
4.9	Abbreviations.....	6
5	Client information .....	7
5.1	Applicant.....	7
5.2	Manufacturer .....	7
6	Test sample information .....	8
6.1	Test Item (declared by applicant).....	8
6.2	Equipment under test .....	10
7	Application details.....	11
7.1	Scheduling .....	11
7.2	Climatic data.....	11
7.3	Opinions and interpretations .....	11
7.4	Modifications .....	11
8	Measurement details.....	12
8.1	Test methodology.....	12
8.2	Test results summary.....	12
8.3	Measurement results .....	13
8.4	Radiated field strength emissions 30 MHz – 1 GHz .....	13
8.5	Radiated field strength emissions above 1 GHz.....	20
9	Annex 101 – Photographs .....	25

## 1 Disclaimer

The test results of this test report relate exclusively to the test item specified in chapter "Test sample information". cetecom advanced does not assume responsibility for any conclusions and generalizations drawn from the test results regarding other specimens or samples of the type of equipment represented by the test item.

The testing service provided by cetecom advanced has been rendered under the current "General Terms and Conditions for cetecom advanced".

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The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at cetecom advanced.

## 2 Related cetecom advanced documents

<b>Document</b>	<b>Content</b>	<b>Reference</b>	<b>Total Pages</b>
Annex 101	Photographs of EUT	Annex 101 is an integral part of this report document	1

## 3 Document history

### 3.1 Current release

Release No.: R01  
 Date of release: May 28, 2025  
 Applied changes: -

### 3.2 Previous releases

Release No.	Applied changes	Date of release
-	-	-

## 4 Test laboratory

### 4.1 Contact information

cetecom advanced GmbH  
 Untertuerkheimer Str. 6-10  
 66117 Saarbruecken  
 Germany

### 4.2 Involved test locations

	Saarbruecken lab		Essen lab
<input type="checkbox"/>	Untertuerkheimer Str. 6-10 66117 Saarbruecken Germany	<input checked="" type="checkbox"/>	Im Teelbruch 116 45219 Essen Germany

### 4.3 Subcontracted laboratories

None

### 4.4 Laboratory listings and recognitions

	Saarbruecken	Essen
FCC	DE0002	DE0003
ISED	DE0001 3462C	DE0001 3462D

### 4.5 Common report information

Version of report template: v25.0101

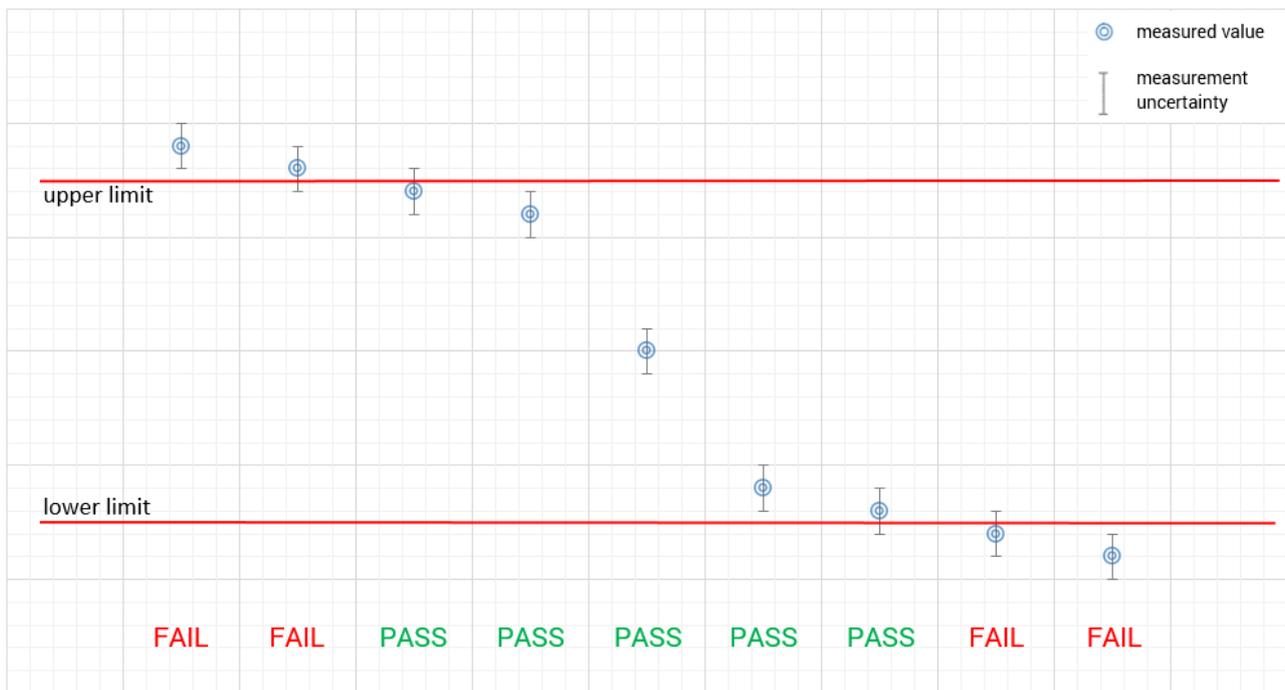
The period is used as a decimal separator and the comma as a thousand separator.

## 4.6 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 8.1.

The measurement uncertainty is mentioned in this test report, see chapter 4.6, 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



### Decision Rule for emission testing:

cetecom advanced GmbH follows [ILAC G8:2019 chapter 4.2.1 \(Simple Acceptance Rule\)](#) according to CISPR 16-4-2:  $U_{Lab} < U_{CISPR}$ . Therefore, the uncertainty is not considered for the statement of conformity in this test report.

## 4.7 Measurement uncertainty

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%		Remarks
Conducted emissions	CISPR 16-2-1	150 kHz - 30 MHz	EMCR (120919):	3.57 dB	-
			LAB1 (225924):	3.58 dB	
Radiated emissions Enclosure	CISPR 16-2-3	30 MHz - 300 MHz	SAC1 (225911):	2.60 dB	E-Field
			SAC2 (225902):	2.62 dB	
			SAC3 (120901):	4.20 dB	
		300 MHz - 1 GHz	SAC1 (225911):	2.90 dB	
			SAC2 (225902):	3.00 dB	
			SAC3 (120901):	4.20 dB	
		1 GHz - 18 GHz	SAC1 (225912):	4.98 dB	
			SAC2 (225903):	4.10 dB	
	SAC3 (120902):	5.10 dB			

## 4.8 Abbreviation and Legend of Measurement Equipment Calibration details

### Legend

Abbreviation interval	Interval of calibration & Verification
2W	2 weeks
12M	12 months
24M	24 months
36M	36 months
10Y	10 Years

Abbreviation Check Type	Description
cnn	Calibration and verification not necessary
cal	Calibration
calchk	Calibration plus intermediate Verification
chk	Verification
cpu	Verification before usage

## 4.9 Abbreviations

DUT	-	Device under Test
EMC	-	Electromagnetic Compatibility
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
NA	-	not applicable
NP	-	not performed
S/N	-	Serial Number
SW	-	Software

## 5 Client information

### 5.1 Applicant

Name: Abel Sensors

Address: Noordeinde 30  
2611 KH Delft  
Netherlands

Contact Person: Ronald Bolijn  
Contact Person's Email: r.bolijn@abelsensors.com

### 5.2 Manufacturer

Name: Abel Sensors

Address: Noordeinde 30  
2611 KH Delft  
Netherlands

## 6 Test sample information

The data about the test samples is given/supplied by the customer and not under control by cetecom advanced GmbH.

### 6.1 Test Item (declared by applicant)

<b>Product:</b>	Fill Level Sensor
<b>Model:</b>	RAD-SEN-05
<b>Type:</b>	n/a
<b>Equipment mobility:</b>	<input type="checkbox"/> Portable use <input checked="" type="checkbox"/> Fixed Use <input type="checkbox"/> Vehicular Use <input type="checkbox"/>
<b>Typical Environment:</b>	<input checked="" type="checkbox"/> Residential, commercial and light industry <input type="checkbox"/> Industrial <input type="checkbox"/>
<b>Mounting position:</b>	<input type="checkbox"/> Tabletop <input type="checkbox"/> Floor standing <input checked="" type="checkbox"/> Wall mounted <input type="checkbox"/> Unknown / Not defined <input type="checkbox"/>
<b>Size [LxWxH]:</b>	13,5 cm x 11,6 cm x 7,4 cm
<b>Additional information:</b>	<ul style="list-style-type: none"> <li>- Test set-up / cabling / operating modes of EUT during tests acc. to customer requirements</li> <li>- This is a class B digital device:</li> <li>- The instructions furnished the user shall include a statement acc. to §15.105 of the used FCC rules</li> </ul>
Remarks: *) maximum cable lengths declared by manufacturer	
<b>Operating frequency:</b>	<input type="checkbox"/> < 108 MHz <input type="checkbox"/> ≥ 108 MHz and < 1.200MHz <input checked="" type="checkbox"/> ≥ 1.200 MHz and 3.000 MHz <input type="checkbox"/> ≥ 3.000 MHz <input type="checkbox"/> unknown <input type="checkbox"/>

<b>Radio frequency considered in this test report:</b>	<input type="checkbox"/>	<b>Integrated radio function(s)</b>
	<input type="checkbox"/>	Cellular
		<input type="checkbox"/> GSM 900/1800
		<input type="checkbox"/> UMTS FDD I / VIII
		<input type="checkbox"/> LTE FDD band 1, 3, 7, 8, 20, 28
		<input type="checkbox"/> 5G NR SA n78
	<input type="checkbox"/>	WLAN
		<input type="checkbox"/> 2.4 GHz Band (2400.0 MHz – 2483.5 MHz)
		<input type="checkbox"/> 5 GHz Band (5150 MHz – 5350 MHz) (5470 MHz – 5725 MHz)
		<input type="checkbox"/> 6 GHz Band (5945 MHz – 6425 MHz)
	<input type="checkbox"/>	GNSS
		<input type="checkbox"/> NAVSTAR GPS
		<input type="checkbox"/> Galileo
		<input type="checkbox"/> Beidou
		<input type="checkbox"/> GLONASS
	<input type="checkbox"/>	ISM
		<input type="checkbox"/> 13.553 MHz – 13.657 MHz
		<input type="checkbox"/> 433.05 MHz – 434.79 MHz
		<input type="checkbox"/> 2400.0 MHz – 2483.5 MHz
		<input type="checkbox"/> 5725.0 MHz – 5875.0 MHz
	<input type="checkbox"/>	Bluetooth
	<input type="checkbox"/> LE (2402 MHz – 2480 MHz)	
	<input type="checkbox"/> classic (2402 MHz – 2480 MHz)	
<input type="checkbox"/>	RFID	
	<input type="checkbox"/> 125 kHz	
	<input type="checkbox"/> 13.56 MHz	
<input type="checkbox"/>	Zigbee	
	<input type="checkbox"/> 868 MHz	
	<input type="checkbox"/> 2400 MHz – 2483 MHz	
<input type="checkbox"/>	Automotive radar	
	<input type="checkbox"/> 24.05 GHz – 24.25 GHz	
	<input type="checkbox"/> 24.05 GHz – 24.5 GHz	
	<input type="checkbox"/> 76 GHz – 77 GHz	
	<input type="checkbox"/> 77 GHz – 81 GHz	
	<input type="checkbox"/> LoRa (868 MHz + 915 MHz)	
	<input type="checkbox"/> Social alarms (869.2 MHz – 869.25 MHz)	
	<input type="checkbox"/> Wireless audio applications (863 MHz – 865 MHz)	
	<input type="checkbox"/> UWB channel	
	<input type="checkbox"/> DECT (1880 MHz – 1900 MHz)	
	<input type="checkbox"/> Wireless charging	
	<input type="checkbox"/> Radar (60 GHz)	
	<input checked="" type="checkbox"/> No radio functionality	

<b>Power Supply:</b>	EUT powered by:	
	<input type="checkbox"/>	AC Mains Defined Input range: 120 V – 230 V / 50 – 60 Hz
	<b>Testing performed at:</b>	
	<input type="checkbox"/>	120 V
	<input type="checkbox"/>	230 V
	<input type="checkbox"/>	400 V
	<input type="checkbox"/>	1 ph. (L1)
	<input type="checkbox"/>	3 ph. (L1, L2, L3)
	<input type="checkbox"/>	PE
	<input type="checkbox"/>	50 Hz
	<input type="checkbox"/>	60 Hz
	<input type="checkbox"/>	Various Settings used during test, see test chapters for details
	<input type="checkbox"/>	DC Mains Defined Input range: V – V
	<b>Testing performed at:</b>	
<input type="checkbox"/>	V	
<input type="checkbox"/>	Ground	
<input type="checkbox"/>	Via Power Supply	
<input type="checkbox"/>	Via PoE	
<input type="checkbox"/>	Via USB Connection	
<input type="checkbox"/>	Various Settings used during test, see test chapters for details	
<input checked="" type="checkbox"/>	Battery	
<input checked="" type="checkbox"/>	3,6V	
<input checked="" type="checkbox"/>	internal	
	Type: Lithium Thionyl	
	external	
	rechargeable	
<input type="checkbox"/>		
Additional information:		

## 6.2 Equipment under test

### 6.2.1 EUT

EUT No. *)	Sample No.	Product	Model	Type	SN	HW	SW
EUT 1	24-1-00147S07_C01	Fill Level Sensor	RAD-SEN-05	--	AEA43638D8	rad7972	4.7.1-54

\*) EUT short description is used to simplify the identification of the EUT in this test report.

### 6.2.2 Set-ups

Set-Up No. *)	Combination of EUT, AE, CAB, SW	Description
1	EUT1	Used for all measurements

\*) Set-up No. is used to simplify the identification of one or more Set-up of EUT, AE, SW, CAB in this test report

### 6.2.3 Operation modes

OP-Mode No. *)	Operating mode(s)	Detailed Description
1	Load testing	Pinging the LoRa module every 100ms Pinging the Radar module every 100ms No Radar measurement; No LoRa message sending Results of all are printed over the serial interface

\*) OP-Mode short description is used to simplify the identification of one or more Operating Modes used during testing in this test report

## 7 Application details

### 7.1 Scheduling

Date of sample reception: 2025-Jan-31  
Date(s) of test: 2025-Feb-17 to 2025-Feb-19

### 7.2 Climatic data

Temperature: 20.0 °C to 20.0 °C  
Relative. humidity: 40.0 %rH to 40.0 %rH  
Barometric pressure: --hPa to -- hPa

### 7.3 Opinions and interpretations

None

### 7.4 Modifications

None

## 8 Measurement details

### 8.1 Test methodology

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-12047-01-00.

Applied test method, standard, rule	Description
FCC Title 47 CFR Part 15B (2025-01)	Federal Communications Commission 47 code of federal regulations Part 15: Radio frequency devices
ICES-003:Issue 7 (2020-10)	Information Technology Equipment (Including Digital Apparatus)

### 8.2 Test results summary

Test case	Port	Reference in FCC ☒	Reference in ISED ☒	Remark	Result
Conducted interference voltage	AC input	§15.107	ICES-003, Issue 7	--	NA2
Radiated field strength emissions 30MHz – 1GHz	Enclosure	§15.109 §15.33 §15.35	ICES-003, Issue 7	--	PASS
Radiated field strength emissions above 1GHz	Enclosure	§15.109 §15.33 §15.35	ICES-003, Issue 7	--	PASS

#### Remarks:

NA <sub>1</sub>	Not tested as not required by applied standard
NA <sub>2</sub>	Not applicable because port does not exist
NA <sub>3</sub>	Not applicable because port only for services
NA <sub>4</sub>	Not applicable because port lengths not longer than 3m
NA <sub>5</sub>	Not tested because used frequency < 108 MHz
NA <sub>6</sub>	Not applicable because the device is for vehicular use
NP <sub>1</sub>	Not tested because excluded / not requested by customer

Remarks:

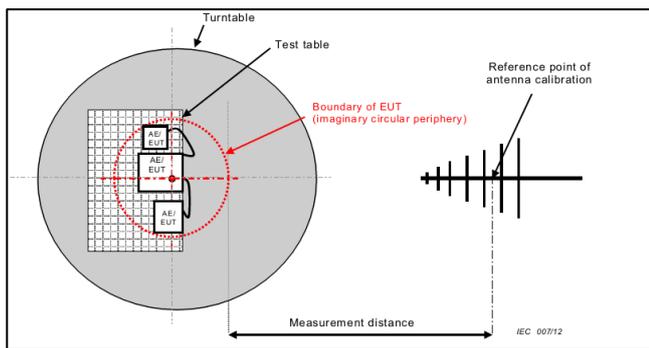
## 8.3 Measurement results

### 8.4 Radiated field strength emissions 30 MHz – 1 GHz

#### 8.4.1 Description of the general test setup and methodology, see below example:

Test site: Measurements between 30 MHz and 1 GHz are performed in the NSA compliant Semi Anechoic Chamber (SAC) according to EMC basic standard. The test site is compliant to CISPR 16-1-4:2019 chap. 5.3, ANSI C63.4:2014 chap. 5.4.2 to 5.4.4 and ANSI (IEEE) C63.4a:2017

#### Schematic:



#### Testing method:

##### Setup:

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a nonconducting table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

##### Step 1 / Premeasurement:

- Pre-measurement, variation of turntable positions:
- The EUT is set in the worst-case operating mode determined.
- The tests are also carried out as a pre-measurement with peak detector (PK), repetitive scan and max-hold mode.
- Azimuth step of turntable = 90°, antenna heights = 1.0 m & 1.82 m, both polarizations (H/V). If the mounting/usual operating position is defined, the under and the top side of the EUT/test set-up will not be measured. The results are documented in a diagram. The peak values shown in this graphic are not finally maximized. Peak values closer than 20 dB to the limit line are displayed explicitly in a table. If no critical frequencies are found (margin to limit >20 dB) the final measurement must be conducted at at least 6 (highest measured or randomly selected, if noise only) peaks.

##### Step 2 / Final measurement:

- Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc. either in 5 m or 3 m semi-anechoic room.
- Final measurement: For the critical frequencies a maximum search is done with PK and CISPR QP detectors: First a frequency zoom within +/- 1.2 MHz (= 10\*IF-BW) of the critical frequencies, then the EUT/test set-up is rotated continuously (if applicable, the EUT orientation will be changed to measure the under and the top side) and the antenna height changed between 1 m & 4 m in order to find the worst case position. The final measurement with the QP detector is carried out in this position and the values are stored in the final result table, which can be found after the diagram.

#### 8.4.2 Formula and Example calculation

$$E_c = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_c \quad (2)$$

- AF = Antenna factor
- C<sub>L</sub> = Cable loss
- D<sub>F</sub> = Distance correction factor (if used)
- E<sub>C</sub> = Electrical field – corrected value
- E<sub>R</sub> = Receiver reading
- G<sub>A</sub> = Gain of pre-amplifier (if used)
- L<sub>T</sub> = Limit
- M = Margin

All units are dB-units, positive margin means value is below limit.

List with correction factors (examples)

Frequency [MHz]	CL [dB]	AF [1/m]
30,000	0,20	12,30
500,000	1,90	16,80
1000,000	2,50	23,30

Example calculation:

For example, at 500 MHz the measured Voltage (E<sub>R</sub>) is 12.35 dBμV, the loss of the cable (C<sub>L</sub>) is 1.90 dB and the antenna factor (AF) is 16.80 dB (m<sup>-1</sup>) the result will be calculated:

$$E_c \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB (m}^{-1}\text{)]} = \mathbf{31.05 \text{ [dB}\mu\text{V/m]}} \text{ (35.69 } \mu\text{V/m)}$$

### 8.4.3 Measurement Protocol(s)

<b>Measurement No.</b>	P1M1
<b>Environmental conditions</b>	Temperature: 20.0 °C Humidity: 40.0% rH
<b>Test date</b>	2025-Feb-17
<b>Operator</b>	Hicham Laayouni
<b>EuT power supply:</b>	3,6VDC
<b>Operating mode</b>	01
<b>Setup</b>	01
<b>Remarks</b>	Frequency @ 934,80MHz is an external interference

Diagram	Measurement Details	Result
3.01 EUT position	<input checked="" type="checkbox"/> Mounting position / usual operating position is defined	<b>PASS</b>
	<input type="checkbox"/> Mounting position / usual operating position undefined <input type="checkbox"/> standing <input type="checkbox"/> laying	

Remark: -

# 3.01

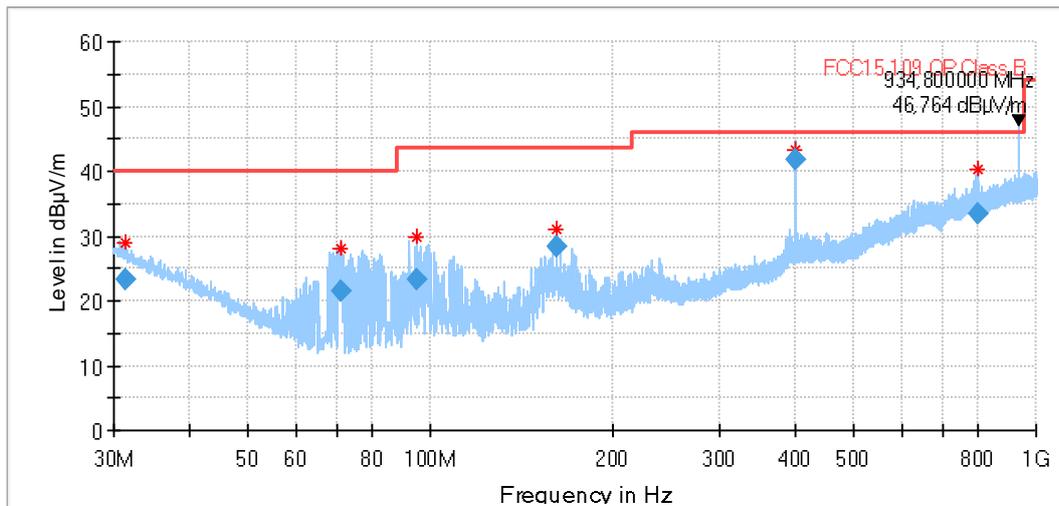
## Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.109 Unintentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
Operation mode:	01
Operator Name:	HLA
Environmental Conditions:	Humidity : 40 %rH; Temperature: 20 °C
verdict:	Passed
comment:	Frequency @ 934,80MHz is an external interference

## EUT Information

PMT number:	24-1-00147S07
--	--

Full Spectrum



## Final Result

Frequency (MHz)	Quasi Peak (dBµV /m)	Limit (dBµV /m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.319000	23.23	40.00	16.77	120.000	128.0	H	268.0	20.2
71.165000	21.50	40.00	18.50	120.000	136.0	V	5.0	6.3
94.839000	23.30	43.50	20.20	120.000	143.0	V	1.0	7.8
161.443000	28.29	43.50	15.21	120.000	170.0	H	104.0	9.1
399.999000	41.88	46.00	4.12	120.000	130.0	V	207.0	19.3
799.915000	33.49	46.00	12.51	120.000	357.0	H	38.0	25.5

### 8.4.5 Limits

Frequency Range [MHz]	Class B <input checked="" type="checkbox"/> (3 meters)		Class A <input type="checkbox"/> (3 meters)	
	Limit [ $\mu$ V/m]	Limit [dB $\mu$ V/m]	Limit [ $\mu$ V/m]	Limit [dB $\mu$ V/m]
30 - 88	100	40.0	282	49.0
88 - 216	150	43.5	473	53.5
216 - 960	200	46.0	661	56.4
960 - 1000	500	54.0	944	59.5

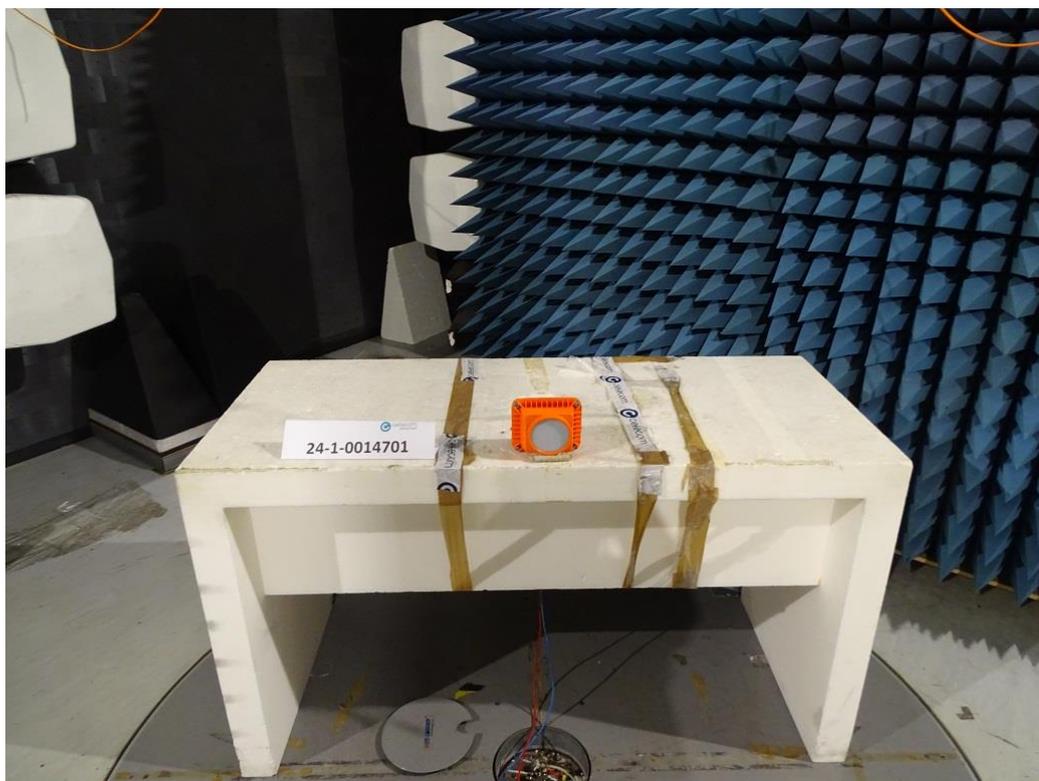
### 8.4.6 Result / Test Plan

EMISSION requirement	Port	Reference in FCC	Reference in ISED	Remark	Result
Radiated field strength emissions 30MHz – 1000 MHz	Enclosure	§15.109	ICES-003 Issue 7	--	Pass

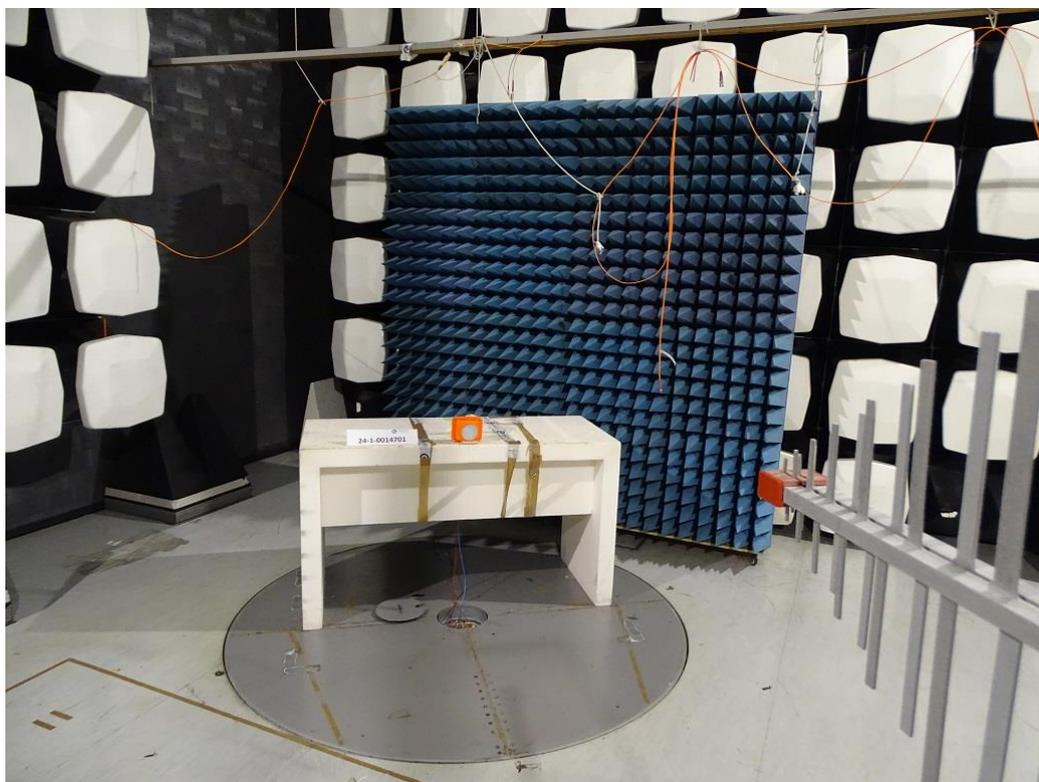
### 8.4.7 Measurement location and Equipment list

ID	Description	Manufacturer	SerNo	CheckType	Last Check	Interval	Next check
	120901 - ESS SAC3 - Radiated Emission <1GHz			Ver.	chk: 2024-Jul-27	chk: 12M	chk: 2025-Jul-27
20341	Digital Multimeter Fluke 112	Fluke Deutschland GmbH	81650455	Cal.	cal: 2024-May-13 chk:	cal: 24M	cal: 2026-May-13
20442	Semi Anechoic Chamber SAC3	ETS-Lindgren GmbH	without	Ver.	chk: 2024-Oct-24	chk: 12M	chk: 2025-Oct-24
20482	Filter Matrix SAC3	cetecom advanced GmbH	without	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20574	Biconilog Hybrid Antenna BTA-L	Frankonia GmbH	980026L	Cal.	cal: 2022-Jun-15 chk:	cal: 36M	cal: 2025-Jun-15
20620	EMI Test Receiver ESU26	Rohde & Schwarz Messgerätebau GmbH	100362	Cal.	cal: 2024-May-15 chk:	cal: 12M	cal: 2025-May-15
20885	Power Supply EA3632A	Agilent Technologies Deutschland GmbH	75305850	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20979	Loop Antenna HFH2-Z2	Rohde & Schwarz Messgerätebau GmbH	872096/61	Cal.	cal: 2024-Sep-16 chk:	cal: 36M	cal: 2027-Sep-16

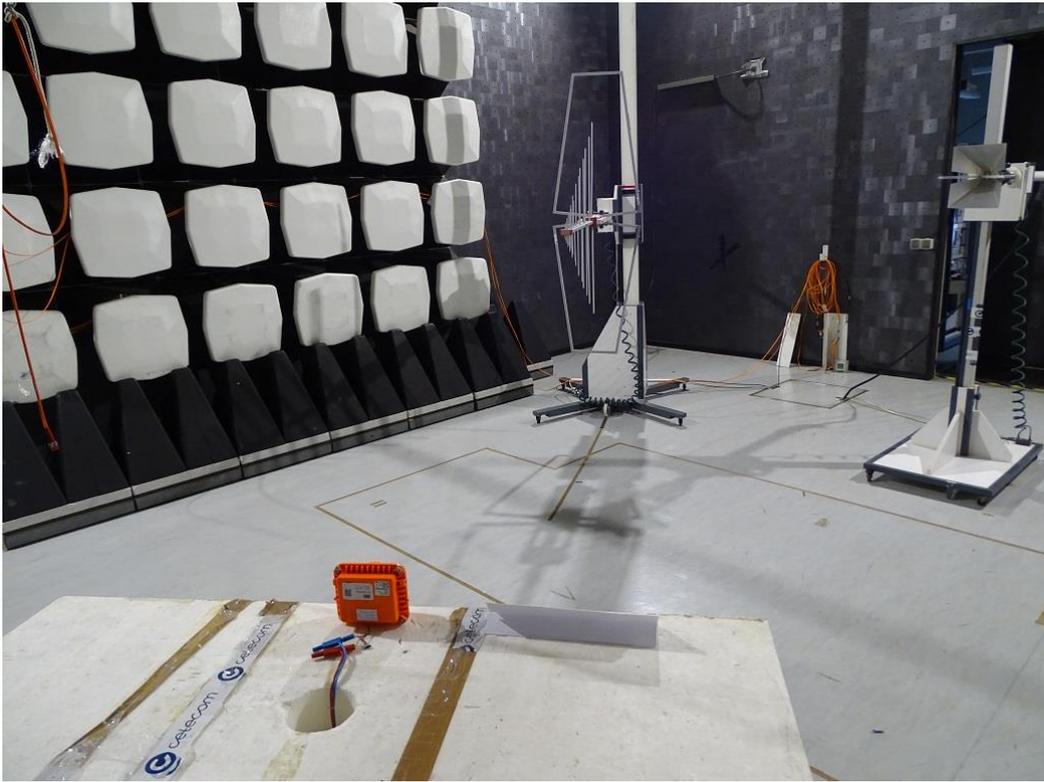
### 8.4.8 Test Set-up Pictures



Picture 1 : Radiated Emission - Setup close up view



Picture 2 : Radiated Emission - Setup overall view



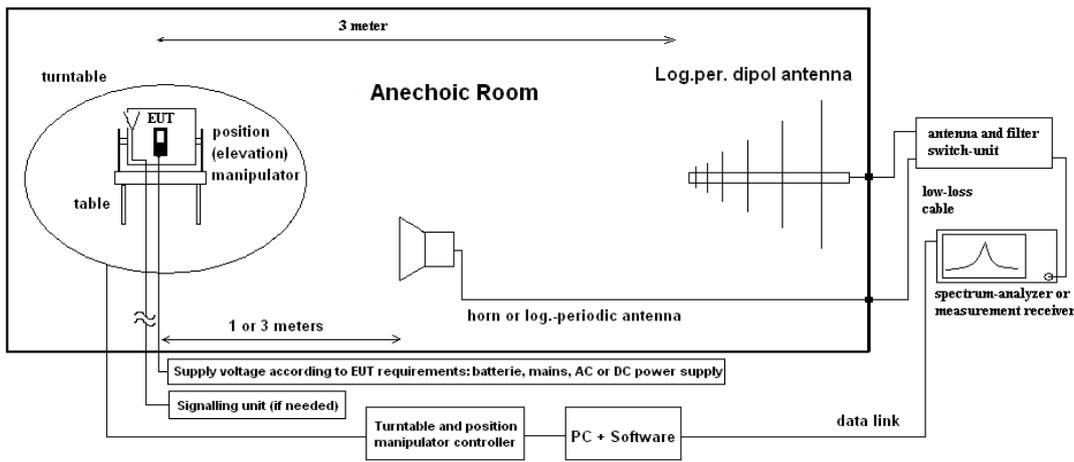
Picture 3 : Radiated Emission - Setup rear side

## 8.5 Radiated field strength emissions above 1 GHz

### 8.5.1 Description of the general test setup and methodology, see below example:

Measurements above 1 GHz are performed in a Fully Anechoic Chamber (FAC). This site is compliant to CISPR 16-1-4:2019+A1:2020 and ANSI (IEEE) C63.25.1-2018 chapter 5.1 (a), method acc. to CISPR 16-1-4:2010 + Cor.1:2010 + A1:2012 + A2:2017, chapter 8.3.3. The measurement distance was set to 3 meters for frequencies up to 18 GHz and 2 meters above 18 GHz. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT. Evaluating the emissions must be done first by an exploratory emissions measurement and a final measurement for most critical frequencies.

#### Schematic:



#### Testing method above 1 GHz:

##### Step 1 - Exploratory, preliminary measurements:

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 15°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics were recorded with an EMI-receiver, broadband antenna and software.

The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are carried out to find the worst case of them. Also, the interconnection cables and equipment position were varied to maximize the emissions. If no critical frequencies are found (margin to limit >20 dB) the final measurement must be conducted at at least 6 (highest measured or randomly selected, if noise only) peaks.

##### Step 2 - Final measurement:

Based on the exploratory measurements, the most critical frequencies are re-measured with a maximum search with PK and CISPR AV detectors:

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

The following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself over 3-orthogonal axis and the height for EUT with large dimensions or three axis scan for portable/small equipment.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according to standard has been carried out.

### 8.5.2 Formula:

$$E_c = E_R + A_F + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_c \quad (2)$$

$E_c$  = Electrical field – corrected value

$E_R$  = Receiver reading

$M$  = Margin

$L_T$  = Limit

$A_F$  = Antenna factor

$C_L$  = Cable loss

$D_F$  = Distance correction factor (if used)

$G_A$  = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

### 8.5.3 Sample Calculation:

Raw Value [dbuV/m]	Antenna factor	Distance correction [dB]	Cable Loss + Pre-Amplifier	Resultng correcton value [dB]	Final result [dBuV/m]
29.37	41.20	--	24.28	16.92	46.3

### 8.5.4 Measurement Protocol(s)

<b>Measurement No.</b>	P2M1
<b>Environmental conditions</b>	Temperature: 20.0 °C Humidity: 40.0% rH
<b>Test date</b>	2025-Feb-19
<b>Operator</b>	Hicham Laayouni
<b>EuT power supply:</b>	3,6 VDC
<b>Operating mode</b>	01
<b>Setup</b>	01
<b>Remarks</b>	

Diagram	Measurement Details	Result
4.01 EUT position	<input checked="" type="checkbox"/> Mounting position / usual operating position is defined	PASS
	<input type="checkbox"/> Mounting position / usual operating position undefined	
	<input type="checkbox"/> standing <input type="checkbox"/> laying	

Remark: -

# 4.01

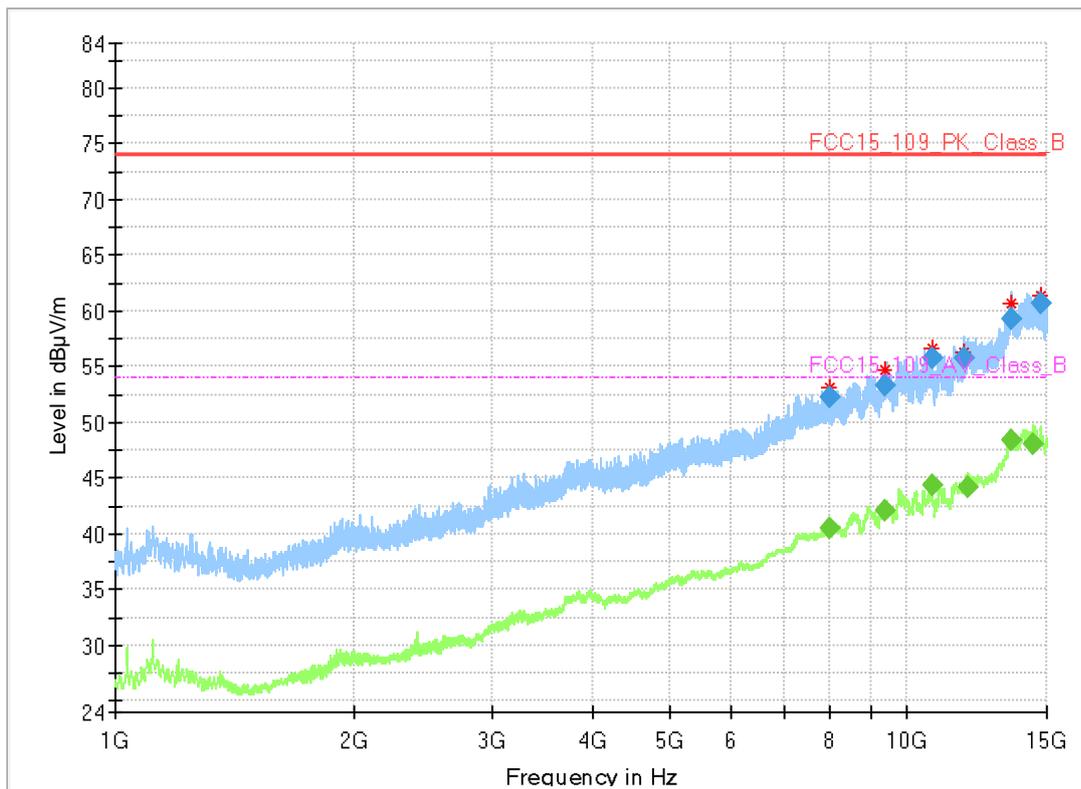
## Common Information

Test Description:	Radiated Field Strength Emission (above 1GHz)
Test Site Location:	CETECOM ADVANCED GmbH / Location Essen
Test Site:	Fully Anechoic Room (FAC2)
Test Standard:	FCC Part 15.109, class B / RSS-Gen., Issue 5
Operating Mode:	01
Equipment Class:	Class B
Environmental Conditions:	Humidity: 41 %rH; Temperature: 21 °C
Operator:	HLa
EUT/Set-up:	01
Verdict:	Passed

## EUT Information

PMT Sample Nr.	24-1-00147S07_C01
	3.6 V DC

Full Spectrum



## Final Result

Frequency (MHz)	Max Peak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
7988.667188	---	40.44	54.00	13.56	200.0	155.0	V	31.0	127.0	4.3
7997.694950	52.1	---	74.00	21.83	200.0	155.0	H	260.0	-22.0	4.4
9385.688988	53.3	---	74.00	20.67	200.0	155.0	V	0.0	120.0	7.8
9389.709025	---	42.08	54.00	11.92	200.0	155.0	V	57.0	-6.0	7.8
10733.912013	55.7	---	74.00	18.21	200.0	155.0	V	215.0	-38.0	8.1
10738.379875	---	44.37	54.00	9.63	200.0	155.0	H	284.0	135.0	8.1
11764.314525	55.7	---	74.00	18.22	200.0	155.0	V	136.0	0.0	9.0
11896.299363	---	44.24	54.00	9.76	200.0	155.0	H	-16.0	45.0	9.4
13501.050413	---	48.43	54.00	5.57	200.0	155.0	V	194.0	36.0	13.6
13506.291200	59.2	---	74.00	14.77	200.0	155.0	H	226.0	30.0	13.6
14400.142275	---	48.11	54.00	5.89	200.0	155.0	H	273.0	70.0	12.9
14743.338863	60.5	---	74.00	13.42	200.0	155.0	V	65.0	94.0	12.6

### 8.5.6 Limits

Frequency Range	Class B ☒ (3 meters)		Class A ☐ (3 meters)		Detector
	Limit [μV/m]	Limit [dBμV/m]	Limit [μV/m]	Limit [dBμV/m]	
Above 1000 MHz	500	54	950	59.5	Average
	5000	74	9500	79.5	Peak

### 8.5.7 Result

Test case	Reference in FCC	Reference in ISED	Remark	Result
Radiated field strength emissions above 1000 MHz	§15.109	ICES-003 Issue 7	--	Pass

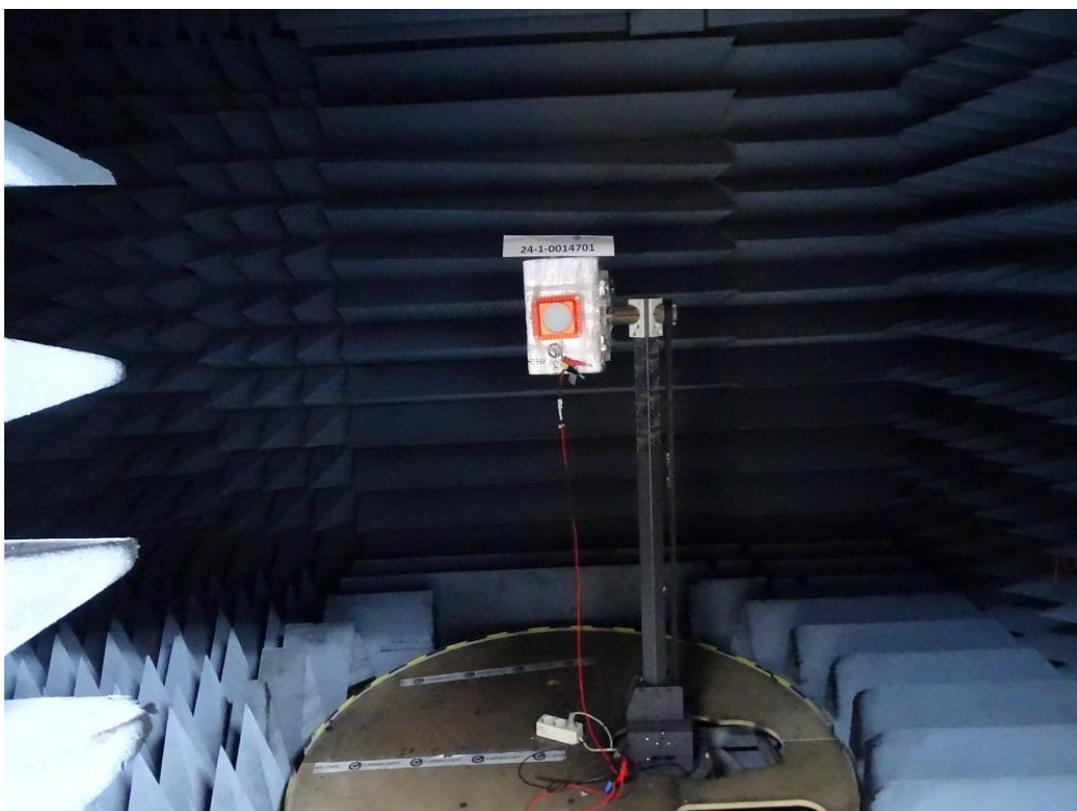
### 8.5.8 Measurement location and Equipment list

ID	Description	Manufacturer	SerNo	CheckType	Last Check	Interval	Next check
120907	FAC2 - Radiated Emissions			Ver.			
20133	Double-Ridged Waveguide Horn Antenna 3115 (Meas 1)	EMCO Elektronik GmbH	9012-3629	Cal.	chk: 2024-Oct-31 cal: 2023-May-22	chk: 24M cal: 36M	chk: 2026-Oct-31 cal: 2026-May-22
20302	Horn Antenna BBHA9170 (Meas 1)	Schwarzbeck Mess-Elektronik OHG	155	Ver. Pre Test	chk: 2020-Apr-15	chk: 12M	
20412	Fully Anechoic Chamber 2	ETS-Lindgren GmbH	without	Ver.	chk: 2024-Mar-15	chk: 12M	chk: 2025-Mar-15
20811	Horn Antenna ASY-SGH-124-SMA	Antenna Systems Solutions S.L	29F14182337	Cal.	cal: 2024-Oct-08	cal: 36M	cal: 2027-Oct-08
20816	SGH Antenna SGH-26-WR10	Anteral S.L.	1144	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20832	Horn Antenna WR90, 90-HA20	TACTRON ELEKTRONIK GmbH & Co. KG	J202064946	Ver.	chk:	chk: 12M	
20836	1-18 GHz Amplifier	Wright Technologies, Inc., Inc.	0001	Ver.	chk: 2024-Oct-18	chk: 24M	chk: 2026-Oct-18
20877	JS42-08001800-16-8P Verstärker	Miteq Inc.	2079991 / 2079992	Ver.	chk: 2024-Oct-18	chk: 24M	chk: 2026-Oct-18
20879	JS44-18004000-40-8P Verstärker	Miteq Inc.	1750117	Ver.	chk: 2024-Oct-18	chk: 24M	chk: 2026-Oct-18
20907	Waveguide WR-15 attenuator STA-30-15-M2	ERAVANT	13256-01	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20908	Waveguide WR 10 attenuator STA-30-10-M2	ERAVANT	13256-01	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20909	Waveguide Horn Antenna PE9881-24	Pasternack Enterprises, Inc.	37/2016	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20910	Frequency Multiplier 936VF-10/385	MI-Wave, Millimeter Wave Products Inc.	142	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20911	Frequency Multiplier 938WF-10/387	MI-Wave, Millimeter Wave Products Inc.	141	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
20912	Low noise Amplifier Module 0.5-4GHz	RF-Lambda Europe GmbH	19041200083	Ver.	chk: 2024-Oct-18	chk: 12M	chk: 2025-Oct-18
20913	Phase Amplitude Stable Cable Assembly DC-40GHz	RF-Lambda Europe GmbH	AC19040001	None	cal: - chk: -	cal: - chk: -	cal: - chk: -
25457	DRG Horn Antenna SAS-574	A.H. Systems, Inc.	383	Cal.	cal: 2022-Mar-28	cal: 36M	cal: 2025-Mar-28

8.5.9 Test Set-up Pictures

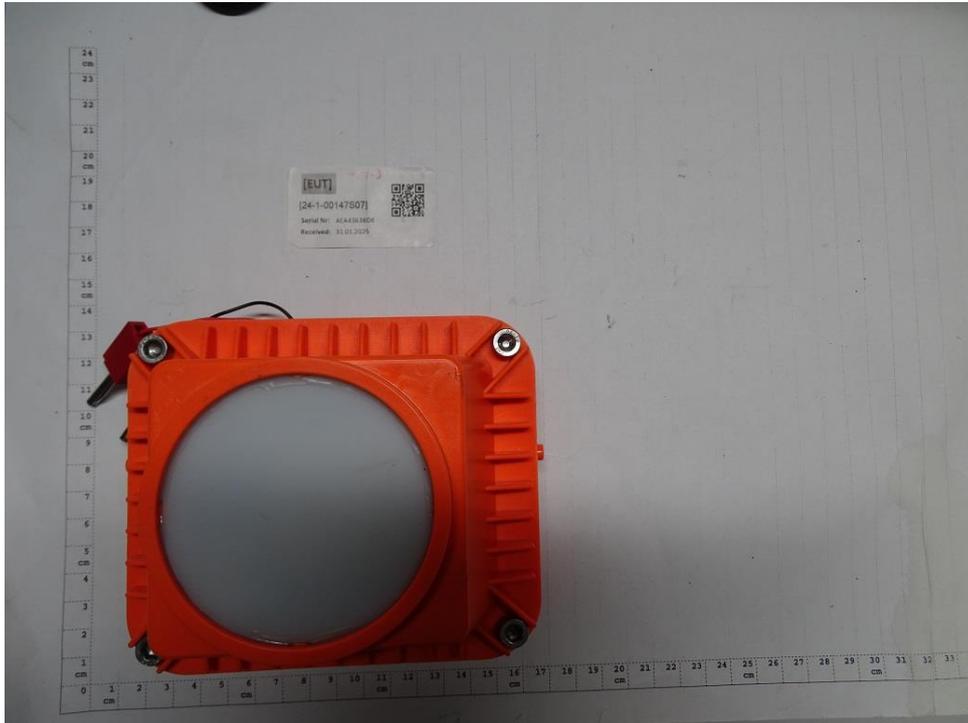


Picture 4 : Radiated Emission - Setup close up view



Picture 5 : Radiated Emission - Setup overall view

## 9 Annex 101 – Photographs



Picture External 1 : Ext. - Front Wireless indicative fill level sensor



Picture External 2 : Ext. - Rear Wireless indicative fill level sensor

- END OF TEST REPORT -