



中国认可  
国际互认  
检测  
TESTING  
CNAS L6478



# TEST REPORT

**Reference No.**..... : WTF25F07173499W004  
**Applicant**..... : Mid Ocean Brands B.V.  
**Address**..... : Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.  
**Manufacturer** ..... : 111033  
**Address**..... : ---  
**Product Name**..... : Apple Find My luggage tag, Smart Apple Find My PU wallet  
**Model No.**..... : MO2599, MO2697  
**Test specification**..... : ETSI EN 301 489-1 V2.2.3 (2019-11)  
 ETSI EN 301 489-3 V2.3.2 (2023-01)  
 ETSI EN 301 489-17 V3.2.4 (2020-09)  
**Date of Receipt sample** .... : 2025-07-21  
**Date of Test** ..... : 2025-07-23 to 2025-07-25  
**Date of Issue**..... : 2025-07-31  
**Test Report Form No.**..... : WEW-301489A-01B  
**Test Result**..... : **Pass**

**Remarks:**

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

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Tested by:

Approved by:

Roy Hong

Danny Zhou



## 1 Test Summary

| Emission   |   |  |  |        |
|--|---|--|--|--------|
| Test   | Test Requirement  | Test Method                                  | Class / Severity   | Result |
| Conducted Emissions  | ETSI EN 301 489-3<br>V2.3.2<br>ETSI EN 301 489-17<br>V3.2.4 | ETSI EN 301 489-1 V2.2.3<br>EN 55032         | Table A.10 of<br>EN 55032  | N/A    |
| Radiation Emission   |   | ETSI EN 301 489-1 V2.2.3<br>EN 55032         | Table A.4 and<br>Table A.5 of<br>EN 55032  | Pass   |
| Harmonic Current<br>Emissions                                    |   | ETSI EN 301 489-1 V2.2.3<br>EN IEC 61000-3-2 | Clause 7 of<br>EN IEC 61000-3-2  | N/A    |
| Voltage Fluctuations<br>and Flicker                              |   | ETSI EN 301 489-1 V2.2.3<br>EN 61000-3-3     | Clause 5 of<br>EN 61000-3-3  | N/A    |
| Immunity   |   |  |  |        |
| Test   | Test Requirement  | Test Method                                  | Class / Severity   | Result |
| Electrostatic Discharge<br>(ESD)                                 | ETSI EN 301 489-3<br>V2.3.2<br>ETSI EN 301 489-17<br>V3.2.4 | ETSI EN 301 489-1 V2.2.3<br>EN 61000-4-2     | $\pm 2/\pm 4$ kV Contact<br>$\pm 2/\pm 4/\pm 8$ kV Air                             | Pass   |
| Radio frequency<br>electromagnetic field<br>(80 MHz to 6 000MHz) |   | ETSI EN 301 489-1 V2.2.3<br>EN 61000-4-3     | 3V/m, 80%, 1kHz,<br>Amp. Mod.  | Pass   |
| Fast Transients<br>Common Mode (EFT)                             |   | ETSI EN 301 489-1 V2.2.3<br>EN 61000-4-4     | AC $\pm 1.0$ kV  | N/A    |
| Surge  |   | ETSI EN 301 489-1 V2.2.3<br>EN 61000-4-5     | $\pm 1$ kV D.M.†<br>$\pm 2$ kV C.M.‡   | N/A    |
| RF common mode<br>0,15 MHz to 80 MHz<br>(CS)                     |   | ETSI EN 301 489-1 V2.2.3<br>EN 61000-4-6     | 3Vrms(emf), 80%,<br>1kHz Amp. Mod.   | N/A    |
| Voltage Dips and<br>Interruptions                                |   | ETSI EN 301 489-1 V2.2.3<br>EN 61000-4-11    | 0 % UT* for 0.5per<br>0 % UT* for 1per<br>70 % UT* for 25per<br>0 % UT* for 250per | N/A    |

Remark:

- Pass Test item meets the requirement  
 Fail Test item does not meet the requirement  
 N/A Test case does not apply to the test object  
 A.M Amplitude Modulation  
 † Differential Mode  
 ‡ Common Mode  
 \*  $U_T$  is the nominal supply voltage



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### 3 General Information

#### 3.1 General Description of E.U.T.

**Product Name** ..... : Apple Find My luggage tag, Smart Apple Find My PU wallet

**Model No.** ..... : MO2599, MO2697

**Remark** ..... : Two models have same electric circuit and PCB layout except appearance and function. Therefore the full tests were performed on model MO2697.

#### 3.2 Details of E.U.T.

**Technical Data** ..... : Battery 3.7V  
Wireless input: 2.5W

#### 3.3 Description of Support Units

The EUT has been tested as an independent unit. MO2697 is the test sample. The full tests were performed in the condition of battery 3.7V input.

#### 3.4 Standards Applicable for Testing

The tests were performed according to following standards:

ETSI EN 301 489-1  
V2.2.3 (2019-11) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;  
Part 1: Common technical requirements; Harmonised Standard for  
ElectroMagnetic Compatibility

ETSI EN 301 489-3  
V2.3.2 (2023-01) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;  
Part 3: Specific conditions for Short Range Devices (SRD) operating on  
frequencies between 9 kHz and 246 GHz; Harmonised Standard for  
ElectroMagnetic Compatibility

ETSI EN 301 489-17  
V3.2.4 (2020-09) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;  
Part 17: Specific conditions for Broadband Data Transmission Systems;  
Harmonised Standard for ElectroMagnetic Compatibility



### 3.5 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 820106.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

### 3.6 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

Yes  No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

### 3.7 Abnormalities from Standard Conditions

None.



## 4 Equipment Used during Test

### 4.1 Equipment List

| <input type="checkbox"/> Mains Terminal Disturbance Voltage 1#(Conducted Emission) |                          |                         |                     |              |            |            |
|--|--------------------------|-------------------------|---------------------|--------------|------------|------------|
| Item   | Equipment                | Manufacturer            | Model No.           | Serial No.   | Cal Date   | Due Date   |
| 1.   | EMI Test Receiver        | R&S                     | ESR3                | 102423       | 2025-01-06 | 2026-01-05 |
| 2.   | LISN                     | R&S                     | ENV216              | 101343       | 2025-01-06 | 2026-01-05 |
| 3.   | Cable                    | HUBER+SUHNER            | CBL2-NN-6M          | 223NN624     | 2025-01-06 | 2026-01-05 |
| 4.   | Switch                   | CD                      | RSU-A4              | RSUA4008     | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> Mains Terminal Disturbance Voltage 2#(Conducted Emission) |                          |                         |                     |              |            |            |
| Item   | Equipment                | Manufacturer            | Model No.           | Serial No.   | Cal Date   | Due Date   |
| 1.   | EMI Test Receiver        | R&S                     | ESCI                | 101178       | 2025-01-06 | 2026-01-05 |
| 2.   | LISN                     | R&S                     | ENV216              | 101215       | 2025-01-07 | 2026-01-06 |
| 3.   | Cable 22                 | Times Microwave Systems | LMR195UF-BMNM-5.00M | ---          | 2025-01-08 | 2026-01-07 |
| 4.   | Switch                   | ESE                     | RSU/M2              | ---          | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> Mains Terminal Disturbance Voltage 3#(Conducted Emission) |                          |                         |                     |              |            |            |
| Item   | Equipment                | Manufacturer            | Model No.           | Serial No.   | Cal Date   | Due Date   |
| 1.   | EMI Test Receiver        | R&S                     | ESR3                | 102842       | 2025-01-06 | 2026-01-05 |
| 2.   | LISN                     | R&S                     | ENV216              | 101542       | 2025-01-06 | 2026-01-05 |
| 3.   | Cable 12                 | YIHENG                  | LMR195UF-NMNM-2.5   | ---          | 2025-01-06 | 2026-01-05 |
| 4.   | Manual RF Switch         | Top Precision           | SW-2                | RSU0402      | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> Radiated Emission (30MHz to 1GHz) 1#                      |                          |                         |                     |              |            |            |
| Item   | Equipment                | Manufacturer            | Model No.           | Serial No.   | Cal Date   | Due Date   |
| 1.   | 3m Semi-anechoic Chamber | CHANGCHUANG             | 9m×6m×6m            | ---          | 2024-01-05 | 2027-01-04 |
| 2.   | EMI Test Receiver        | R&S                     | ESR7                | 101566       | 2025-01-06 | 2026-01-05 |
| 3.   | Trilog Broadband Antenna | SCHWARZBECK             | VULB 9162           | 9162-117     | 2025-01-12 | 2026-01-11 |
| 4.   | Cable 20                 | Times Microwave Systems | RG223-NMNM-10M      | ---          | 2025-01-06 | 2026-01-05 |
| 5.   | Cable 21                 | Times Microwave Systems | RG223-NMNM-3M       | ---          | 2025-01-06 | 2026-01-05 |
| <input checked="" type="checkbox"/> Radiated Emission (30MHz to 1GHz) 2#           |                          |                         |                     |              |            |            |
| Item   | Equipment                | Manufacturer            | Model No.           | Serial No.   | Cal Date   | Due Date   |
| 1.   | 3m Semi-anechoic Chamber | YIHENG                  | 9m×6m×6m            | YH2021071801 | 2024-01-06 | 2027-01-05 |
| 2.   | EMI Test Receiver        | R&S                     | ESR7                | 102454       | 2025-01-06 | 2026-01-05 |
| 3.   | Trilog Broadband Antenna | SCHWARZBECK             | VULB 9163           | 01418        | 2025-02-08 | 2026-02-07 |
| 4.   | Cable 14                 | YIHENG                  | LMR240UF-NMSM-7.5   | ---          | 2025-01-06 | 2026-01-05 |



| <input checked="" type="checkbox"/> Radiated Emission (1GHz to 6GHz) 1# |  |                         |               |              |            |            |
|---|--|-------------------------|---------------|--------------|------------|------------|
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | 3m Semi-anechoic Chamber               | CHANGCHUANG             | 9m×6m×6m      | -            | 2024-01-05 | 2027-01-04 |
| 2.  | EMI Test Receiver                      | R&S                     | ESR7          | 101566       | 2025-01-06 | 2026-01-05 |
| 3.  | Broad-band Horn Antenna                | SCHWARZBECK             | BBHA 9120 D   | 01561        | 2025-01-13 | 2026-01-12 |
| 4.  | Coaxial Cable (above 1GHz)             | Times-Microwave         | CBL5-NN       | -            | 2025-01-06 | 2026-01-05 |
| 5.  | Preamplifier                           | Lunar E M               | LNA1G18-40    | 20160501002  | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> Radiated Emission (1GHz to 6GHz) 2#            |  |                         |               |              |            |            |
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | 3m Semi-anechoic Chamber               | YIHENG                  | 9m×6m×6m      | YH2021071801 | 2024-01-06 | 2027-01-05 |
| 2.  | EMI Test Receiver                      | R&S                     | ESR7          | 102454       | 2025-01-06 | 2026-01-05 |
| 3.  | Broad-band Horn Antenna                | SCHWARZBECK             | BBHA9120D     | 02465        | 2025-01-13 | 2026-01-12 |
| 4.  | Coaxial Cable (above 1GHz)             | Times-Microwave Systems | SFT205-NMSM-7 | -            | 2025-01-06 | 2026-01-05 |
| 5.  | Preamplifier                           | Tonscend                | TAP0118045    | AP21J806168  | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> Harmonics and Flicker Measuring System         |  |                         |               |              |            |            |
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | Harmonics and Flicker Measuring System | YUANFANG                | HFM-3000      | V200         | 2025-01-07 | 2026-01-06 |
| <input checked="" type="checkbox"/> ESD                                 |  |                         |               |              |            |            |
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | ESD Simulator                          | TESEQ                   | NSG437        | 521          | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> EFT & Voltage Dips and Interruptions           |  |                         |               |              |            |            |
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | EMS test system                        | TESEQ                   | NSG3040       | 1858         | 2025-01-06 | 2026-01-05 |
| 2.  | Step transformer                       | TESEQ                   | INA6501       | 206          | 2025-01-06 | 2026-01-05 |
| 3.  | Coupling clamp                         | TESEQ                   | CDN8014       | 31405        | 2025-01-07 | 2026-01-06 |
| <input type="checkbox"/> Surge  |  |                         |               |              |            |            |
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | Surge Simulator                        | TESEQ                   | NSG3060       | 1395         | 2025-01-06 | 2026-01-05 |
| <input type="checkbox"/> Injected Currents                              |  |                         |               |              |            |            |
| Item  | Equipment                              | Manufacturer            | Model No.     | Serial No.   | Cal Date   | Due Date   |
| 1.  | Conducted Immunity test system         | TESEQ                   | NSG4070       | 45345        | 2025-01-06 | 2026-01-05 |
| 2.  | CDN                                    | TESEQ                   | CDN M016      | 31586        | 2025-01-07 | 2026-01-06 |
| 3.  | EM Clamp                               | TESEQ                   | KEMZ801       | 32362        | 2025-01-06 | 2026-01-05 |
| 4.  | 6dB Attenuator                         | TESEQ                   | ATN6075       | 32122        | 2025-01-07 | 2026-01-06 |



| ☒ Radio-frequency electromagnetic fields |   |              |                   |            |            |            |
|--|---|--------------|-------------------|------------|------------|------------|
| Item                                     | Equipment                                   | Manufacturer | Model No.         | Serial No. | Cal Date   | Due Date   |
| 1.                                       | RF Power Amplifier                          | MICOTOP      | MPA-80-1000-250   | MPA2405139 | 2025-01-06 | 2026-01-05 |
| 2.                                       | RF Power Amplifier                          | MICOTOP      | MPA-1000-6000-100 | MPA2405140 | 2025-01-06 | 2026-01-05 |
| 3.                                       | Stacked double logarithmic periodic antenna | SCHWARZBECK  | STLP9128E-SPECIAL | 142        | 2025-01-15 | 2026-01-14 |
| 4.                                       | Stacked double logarithmic periodic antenna | SCHWARZBECK  | STLP 9149         | 476        | 2025-01-13 | 2026-01-12 |
| 5.                                       | Analog signal generator                     | RS           | SMB100A           | 105566     | 2025-01-06 | 2026-01-05 |
| 6.                                       | Power meter                                 | RS           | NRP6A             | 101133     | 2025-01-06 | 2026-01-05 |
| 7.                                       | Power meter                                 | RS           | NRP6A             | 101134     | 2025-01-06 | 2026-01-05 |

: Not Used

: Used

#### 4.2 Software List

| Description                               | Manufacturer | Model    | Version        |
|---|--------------|----------|----------------|
| EMI Test Software (Conducted Emission 1#) | FARATRONIC   | EZ-EMC   | EMEC-3A1       |
| EMI Test Software (Conducted Emission 2#) | FARATRONIC   | EZ-CON   | FARAD-3A1.1+   |
| EMI Test Software (Conducted Emission 3#) | FARATRONIC   | EZ-EMC   | EMC-CON 3A1.1+ |
| EMI Test Software (Radiated Emission 1#)  | FARATRONIC   | EZ-EMC   | RA-03A1-2      |
| EMI Test Software (Radiated Emission 2#)  | FARATRONIC   | EZ-EMC   | RA-03A1-2      |
| Harmonics and Flicker Test Software       | YUANFANG     | HFM-3000 | V2.00.147      |
| Radiated Immunity Test Software           | Chinese EMC  | EMS      | V1.0.0.0       |

#### 4.3 Measurement Uncertainty

| Test Item          | Frequency Range | Uncertainty | Note |
|--------------------|-----------------|-------------|------|
| Conducted Emission | 150kHz~30MHz    | ±2.6dB      | (1)  |
| Radiated Emission  | 30MHz~1GHz      | ±4.5dB      | (1)  |
| Radiated Emission  | 1GHz~6GHz       | ±4.5dB      | (1)  |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .





#### 4.4 Special Accessories and Auxiliary Equipment

| Item | Equipment | Technical Data | Manufacturer | Model No. | Serial No. |
|------|-----------|----------------|--------------|-----------|------------|
| 1.   | /         | /              | /            | /         | /          |

#### 4.5 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

**If  $U_{LAB}$  is less than or equal to  $U_{cispr}$ , then**

- Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

**If  $U_{LAB}$  is greater than  $U_{cispr}$ , then**

- Compliance is deemed to occur if no measured disturbance level, increased by  $(U_{LAB} - U_{cispr})$ , exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{LAB} - U_{cispr})$ , exceeds the disturbance limit.

# WALTEK



## 5 EMC Requirements for Emissions

### 5.1 Radiated Emission

|                               |   |
|-------------------------------|---|
| <b>Test Requirement</b> ..... | : ETSI EN 301 489-3, ETSI EN 301 489-17   |
| <b>Test Method</b> .....      | : ETSI EN 301 489-1, EN 55032, Class B  |
| <b>Frequency Range</b> .....  | : 30MHz to 1GHz, 1GHz to 6GHz   |
| <b>Class/Severity</b> .....   | : Class B/ Table A.4 and A.5 of EN 55032  |
| <b>Detector</b> .....         | : Peak for pre-scan (120kHz Resolution Bandwidth Below 1GHz;<br>1MHz Resolution Bandwidth Above 1GHz) |

#### 5.1.1 EUT Operation:

##### Operating Environment:

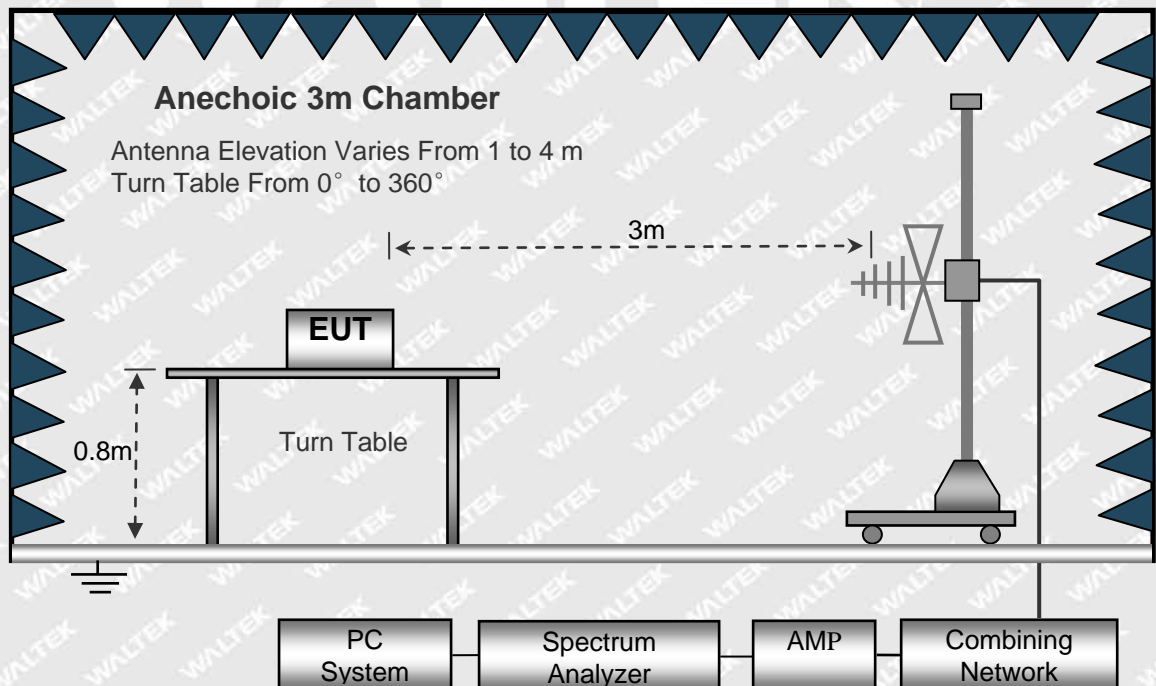
|                                   |            |
|-----------------------------------|------------|
| <b>Temperature</b> .....          | : 22.6°C   |
| <b>Humidity</b> .....             | : 50.9%RH  |
| <b>Atmospheric Pressure</b> ..... | : 101.2kPa |

##### EUT Operation:

|                             |                      |
|-----------------------------|----------------------|
| <b>Input Voltage</b> .....  | : Battery 3.7V       |
| <b>Operating Mode</b> ..... | : Communication mode |

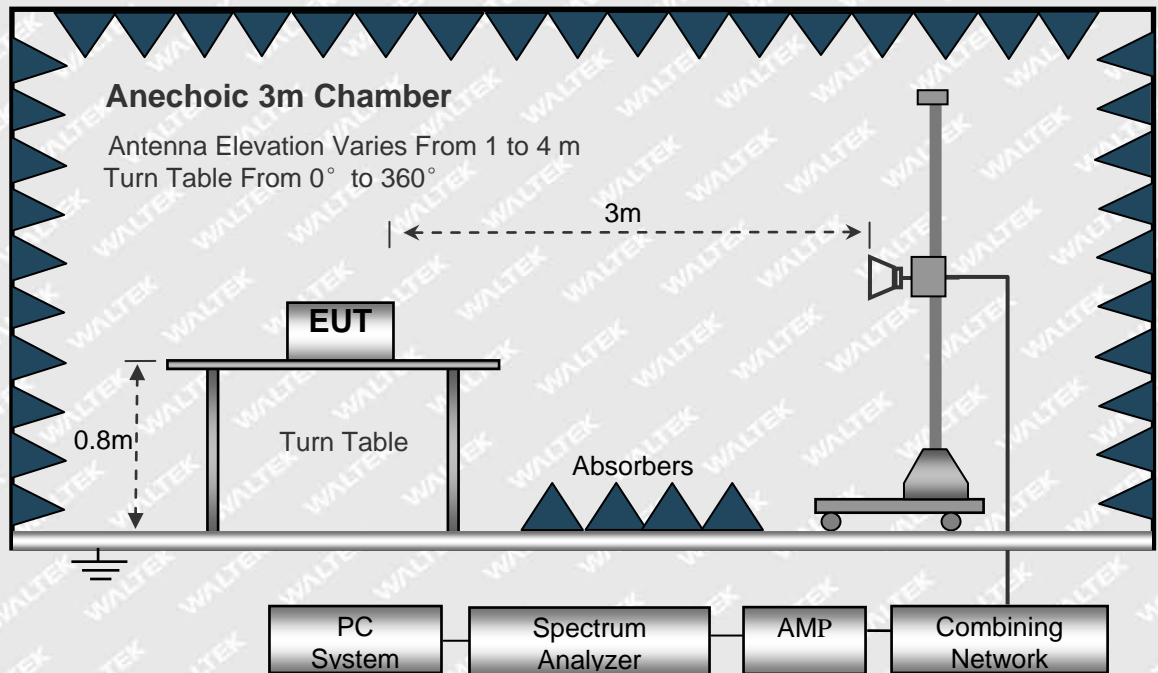
#### 5.1.2 Test Setup

The radiated emission tests were performed using the setup accordance with the EN 55032.  
Frequency Range: Below 1 GHz





Frequency Range: Above 1 GHz



### 5.1.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Corr. Factor}$$

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.

The equation for margin calculation is as follows:

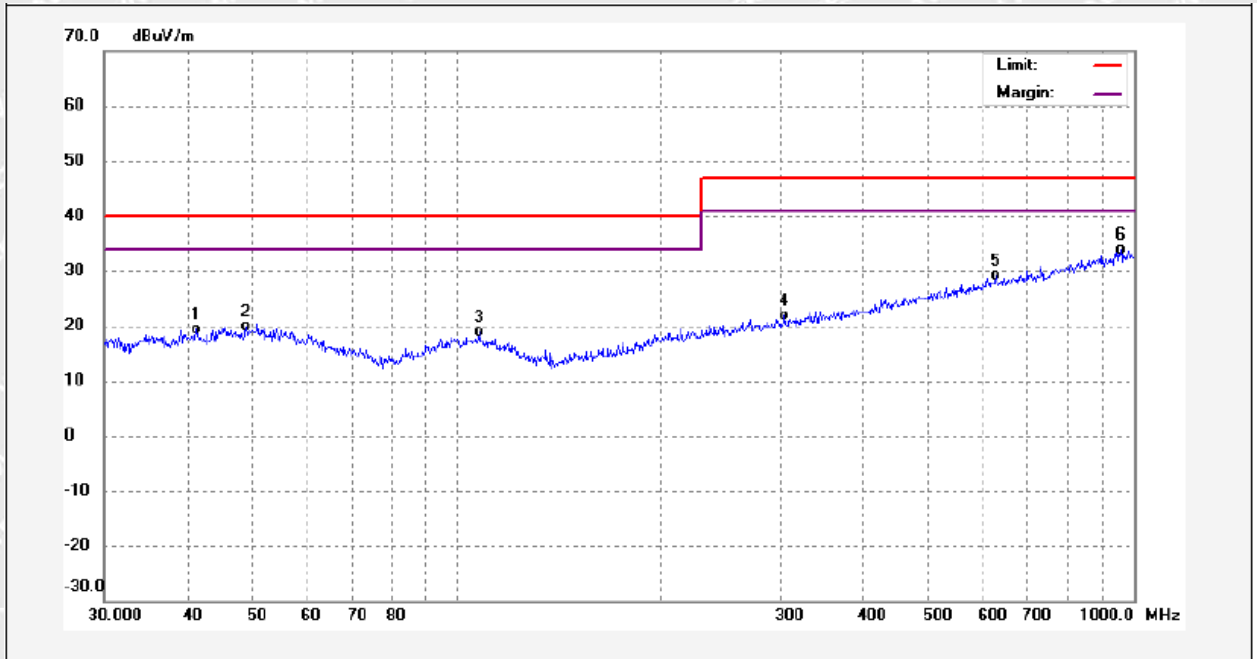
$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$



### 5.1.4 Test Result

Frequency Range: 30MHz ~ 1000MHz

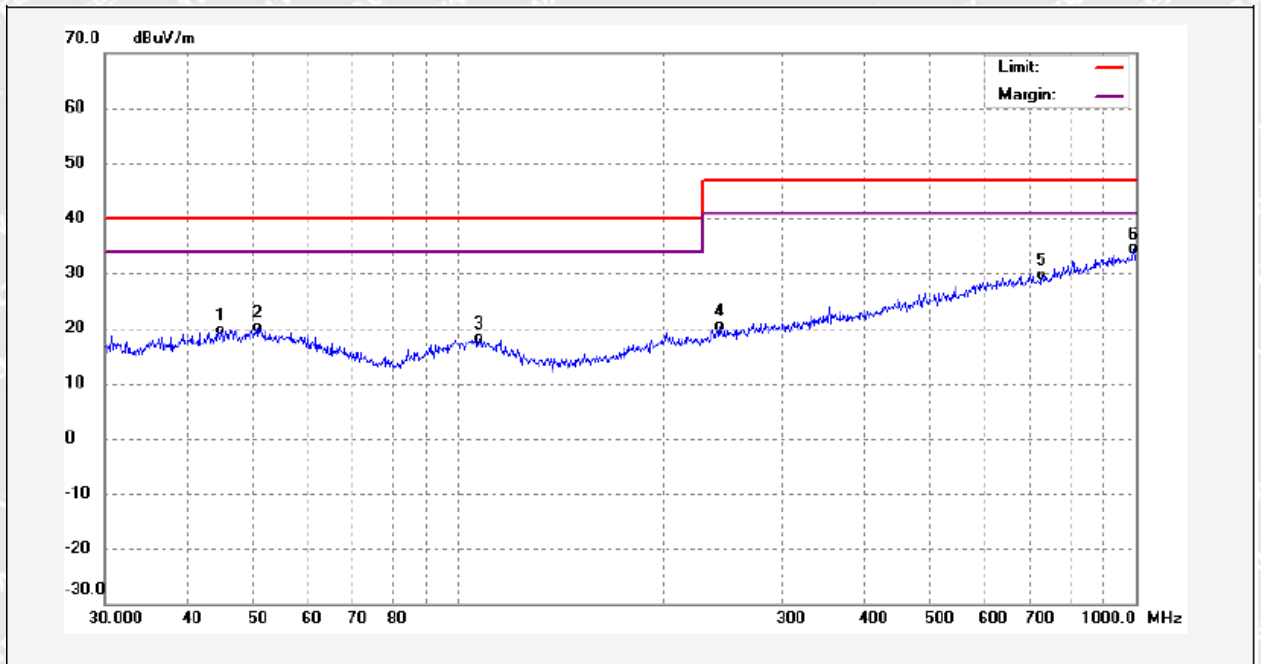
Antenna Polarization: Vertical



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 41.2186     | 0.50             | 18.83       | 19.33           | 40.00          | -20.67      | QP       |        |
| 2   | 48.8258     | -0.11            | 19.91       | 19.80           | 40.00          | -20.20      | QP       |        |
| 3   | 107.9634    | 0.74             | 18.16       | 18.90           | 40.00          | -21.10      | QP       |        |
| 4   | 304.8236    | 1.21             | 20.67       | 21.88           | 47.00          | -25.12      | QP       |        |
| 5   | 625.7360    | 1.90             | 27.13       | 29.03           | 47.00          | -17.97      | QP       |        |
| 6   | 955.7732    | 3.28             | 30.60       | 33.88           | 47.00          | -13.12      | QP       |        |



Antenna Polarization: Horizontal

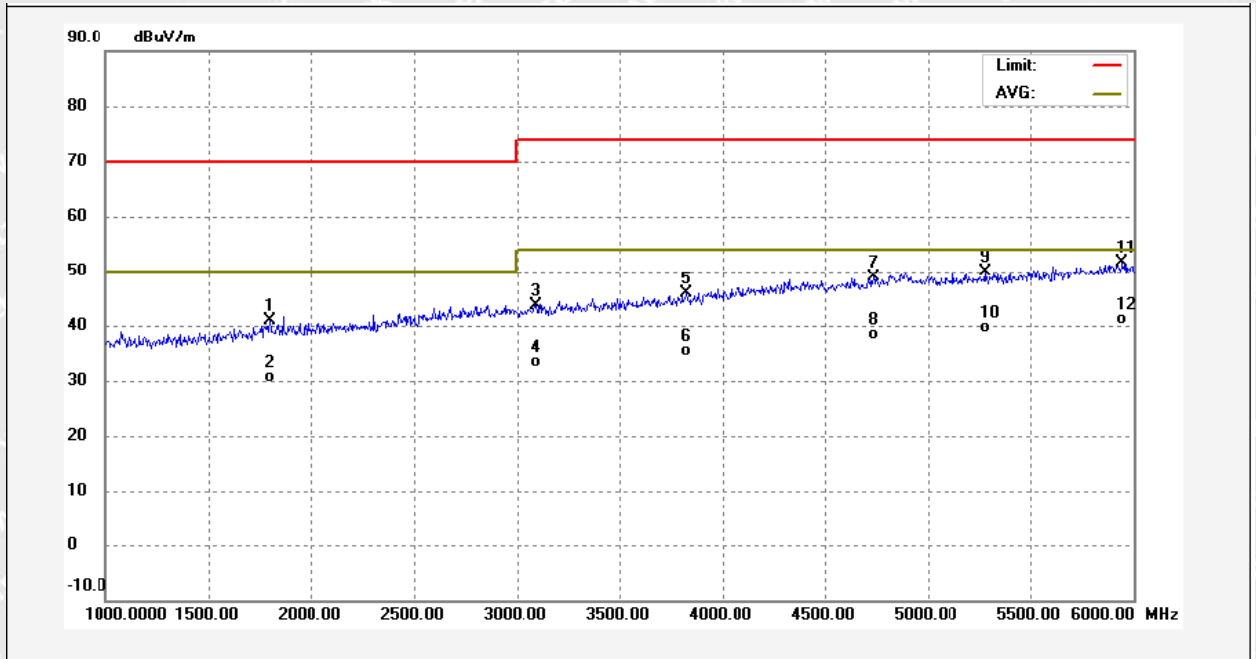


| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 44.7121     | 0.23             | 19.48       | 19.71           | 40.00          | -20.29      | QP       |        |
| 2   | 50.6925     | 0.32             | 19.87       | 20.19           | 40.00          | -19.81      | QP       |        |
| 3   | 107.2089    | -0.06            | 18.24       | 18.18           | 40.00          | -21.82      | QP       |        |
| 4   | 243.0361    | 1.12             | 19.21       | 20.33           | 47.00          | -26.67      | QP       |        |
| 5   | 725.2777    | 2.05             | 27.69       | 29.74           | 47.00          | -17.26      | QP       |        |
| 6   | 996.4996    | 3.21             | 31.09       | 34.30           | 47.00          | -12.70      | QP       |        |



**Frequency Range: 1000MHz ~ 6000MHz**

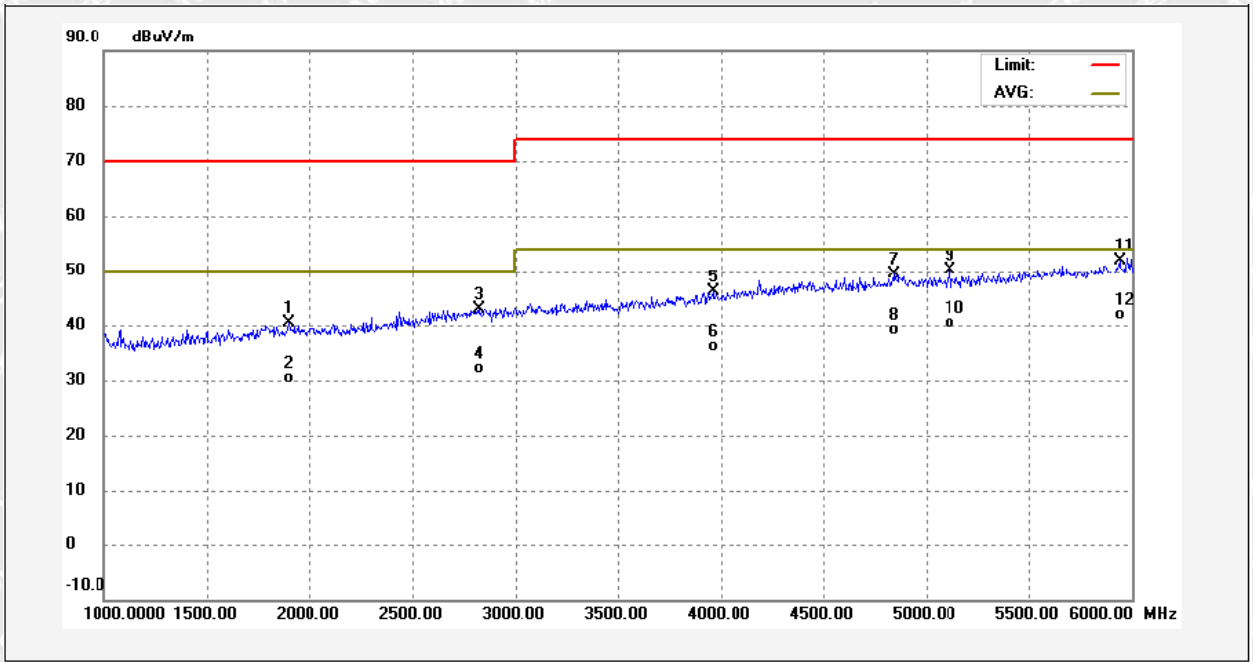
Antenna Polarization: Vertical



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 1799.500    | 11.89            | 28.89       | 40.78           | 70.00          | -29.22      | peak     |        |
| 2   | 1799.500    | 1.65             | 28.89       | 30.54           | 50.00          | -19.46      | AVG      |        |
| 3   | 3095.500    | 11.72            | 31.84       | 43.56           | 74.00          | -30.44      | peak     |        |
| 4   | 3095.500    | 1.44             | 31.84       | 33.28           | 54.00          | -20.72      | AVG      |        |
| 5   | 3829.000    | 12.32            | 33.53       | 45.85           | 74.00          | -28.15      | peak     |        |
| 6   | 3829.000    | 1.87             | 33.53       | 35.40           | 54.00          | -18.60      | AVG      |        |
| 7   | 4735.000    | 13.43            | 35.33       | 48.76           | 74.00          | -25.24      | peak     |        |
| 8   | 4735.000    | 3.09             | 35.33       | 38.42           | 54.00          | -15.58      | AVG      |        |
| 9   | 5282.500    | 13.64            | 36.29       | 49.93           | 74.00          | -24.07      | peak     |        |
| 10  | 5282.500    | 3.30             | 36.29       | 39.59           | 54.00          | -14.41      | AVG      |        |
| 11  | 5946.000    | 14.39            | 37.33       | 51.72           | 74.00          | -22.28      | peak     |        |
| 12  | 5946.000    | 3.76             | 37.33       | 41.09           | 54.00          | -12.91      | AVG      |        |



Antenna Polarization: Horizontal



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 1896.000    | 11.37            | 29.05       | 40.42           | 70.00          | -29.58      | peak     |        |
| 2   | 1896.000    | 1.28             | 29.05       | 30.33           | 50.00          | -19.67      | AVG      |        |
| 3   | 2828.500    | 11.83            | 31.15       | 42.98           | 70.00          | -27.02      | peak     |        |
| 4   | 2828.500    | 1.00             | 31.15       | 32.15           | 50.00          | -17.85      | AVG      |        |
| 5   | 3963.000    | 12.01            | 34.05       | 46.06           | 74.00          | -27.94      | peak     |        |
| 6   | 3963.000    | 2.15             | 34.05       | 36.20           | 54.00          | -17.80      | AVG      |        |
| 7   | 4846.000    | 13.69            | 35.61       | 49.30           | 74.00          | -24.70      | peak     |        |
| 8   | 4846.000    | 3.57             | 35.61       | 39.18           | 54.00          | -14.82      | AVG      |        |
| 9   | 5118.500    | 13.91            | 36.12       | 50.03           | 74.00          | -23.97      | peak     |        |
| 10  | 5118.500    | 4.16             | 36.12       | 40.28           | 54.00          | -13.72      | AVG      |        |
| 11  | 5941.000    | 14.65            | 37.32       | 51.97           | 74.00          | -22.03      | peak     |        |
| 12  | 5941.000    | 4.53             | 37.32       | 41.85           | 54.00          | -12.15      | AVG      |        |



## 6 EMC Requirement for Immunity

### 6.1 Performance Criteria

#### 6.1.1 General performance criteria

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;

#### 6.1.2 Performance table

| Criteria | During test  | After test  |
|----------|--|---|
| A        | Operate as intended<br>No loss of function<br>No unintentional responses | Operate as intended<br>No loss of function<br>No degradation of performance<br>No loss of stored data or user programmable functions                        |
| B        | May show loss of function<br>No unintentional responses                  | Operate as intended<br>Lost function(s) shall be self-recoverable<br>No degradation of performance<br>No loss of stored data or user programmable functions |

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## 6.2 Electrostatic Discharge(ESD)

|                                     |  |
|-------------------------------------|--|
| <b>Test Requirement</b> .....       | : ETSI EN 301 489-3, ETSI EN 301 489-17  |
| <b>Test Method</b> .....            | : ETSI EN 301 489-1, EN 61000-4-2  |
| <b>Discharge Impedance</b> .....    | : 330 $\Omega$ / 150 pF  |
| <b>Discharge Voltage</b> .....      | : Air Discharge: +/-2,4,8 KV<br>Contact Discharge: +/-2,4 KV<br>HCP & VCP: +/-2,4 KV |
| <b>Polarity</b> .....               | : Positive & Negative  |
| <b>Discharge Repeat Times</b> ..... | : At Least 20 times at each test point   |
| <b>Discharge Mode</b> .....         | : Single Discharge   |
| <b>Discharge Period</b> .....       | : 1 second minimum   |

### 6.2.1 E.U.T. Operation

#### Operating Environment:

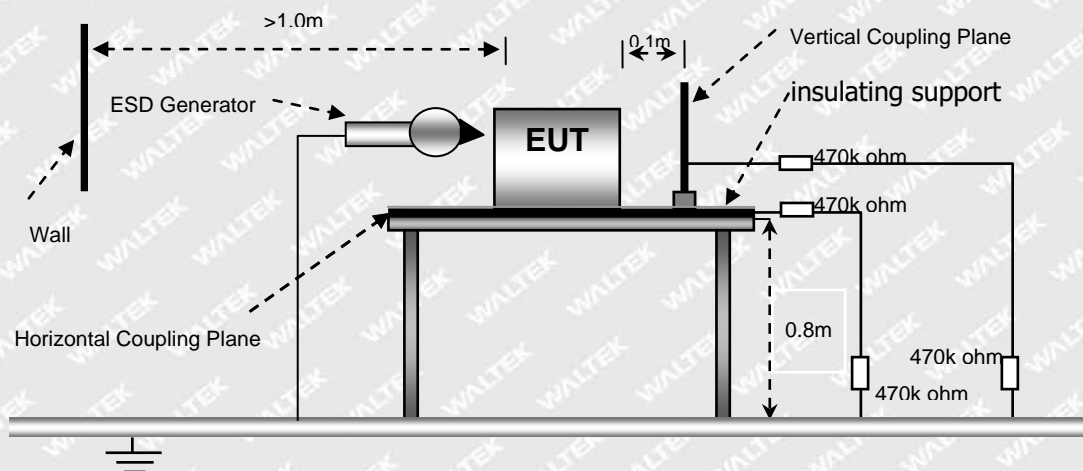
|                                   |            |
|-----------------------------------|------------|
| <b>Temperature</b> .....          | : 21.3°C   |
| <b>Humidity</b> .....             | : 51.6%RH  |
| <b>Atmospheric Pressure</b> ..... | : 100.1kPa |

#### EUT Operation:

|                             |                      |
|-----------------------------|----------------------|
| <b>Input Voltage</b> .....  | : Battery 3.7V       |
| <b>Operating Mode</b> ..... | : Communication mode |

### 6.2.2 Block Diagram of Setup

The ESD test was performed in accordance with the EN 61000-4-2.





### 6.2.3 Test Result

| Direct Discharge        |                       |            | Performance Criteria |               |
|-------------------------|-----------------------|------------|----------------------|---------------|
| Discharge Level (kV)    | Performance Criterion | Test Point | Contact Discharge    | Air Discharge |
| $\pm 2 / \pm 4 / \pm 8$ | B                     | 1          | N/A                  | Pass*         |
| $\pm 2 / \pm 4$         | B                     | 2          | Pass*                | N/A           |

Remark:

Test points 1. All Exposed Surface & Seams; 2. All metallic part

\* During the test no deviation was detected to the selected operation mode(s)

| Indirect Discharge   |                       |            | Performance Criteria |                   |
|----------------------|-----------------------|------------|----------------------|-------------------|
| Discharge Level (kV) | Performance Criterion | Test Point | Horizontal Coupling  | Vertical Coupling |
| $\pm 2 / \pm 4$      | B                     | 1          | Pass*                | Pass*             |

Remark:

Test points 1. All sides

\* During the test no deviation was detected to the selected operation mode(s)

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### 6.3 RF Electromagnetic Field (80MHz to 6 000MHz) (RS)

|                                   |   |
|-----------------------------------|---|
| <b>Test Requirement</b> .....     | : ETSI EN 301 489-3, ETSI EN 301 489-17 |
| <b>Test Method</b> .....          | : ETSI EN 301 489-1, EN 61000-4-3       |
| <b>Face of EUT</b> .....          | : Front, Back, Left, Right              |
| <b>Frequency Range</b> .....      | : 80MHz to 6 000MHz                     |
| <b>Test Level</b> .....           | : 3V/m                                  |
| <b>Modulation</b> .....           | : 80%, 1kHz Amplitude Modulation.       |
| <b>Antenna polarisation</b> ..... | : Horizontal& Vertical                  |

#### 6.3.1 E.U.T. Operation

##### Operating Environment:

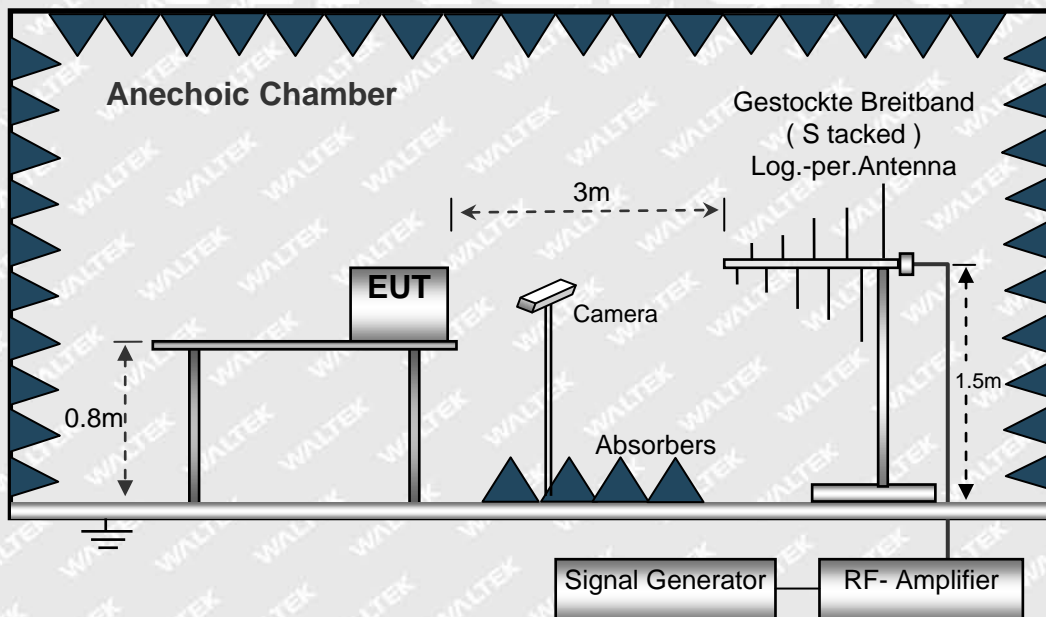
|                                   |            |
|-----------------------------------|------------|
| <b>Temperature</b> .....          | : 21.6°C   |
| <b>Humidity</b> .....             | : 51.5%RH  |
| <b>Atmospheric Pressure</b> ..... | : 100.2kPa |

##### EUT Operation:

|                             |                      |
|-----------------------------|----------------------|
| <b>Input Voltage</b> .....  | : Battery 3.7V       |
| <b>Operating Mode</b> ..... | : Communication mode |

#### 6.3.2 Block Diagram of Setup

The Radiated Immunity test was performed in accordance with the EN 61000-4-3.





### 6.3.3 Test Result

| Frequency          | Face of EUT              | Antenna polarisation | Test Level | Step Size | Dwell Time | Performance Criterion | Result |
|--------------------|--------------------------|----------------------|------------|-----------|------------|-----------------------|--------|
| 80MHz to 1000MHz   | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 80MHz to 1000MHz   | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 1000MHz to 6000MHz | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 1000MHz to 6000MHz | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |

Remark:

- \* During the test no deviation was detected to the selected operation mode(s)

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## 7 Photographs - Test Setup

### 7.1 Photograph - Radiated Emissions Test Setup

Below 1000MHz

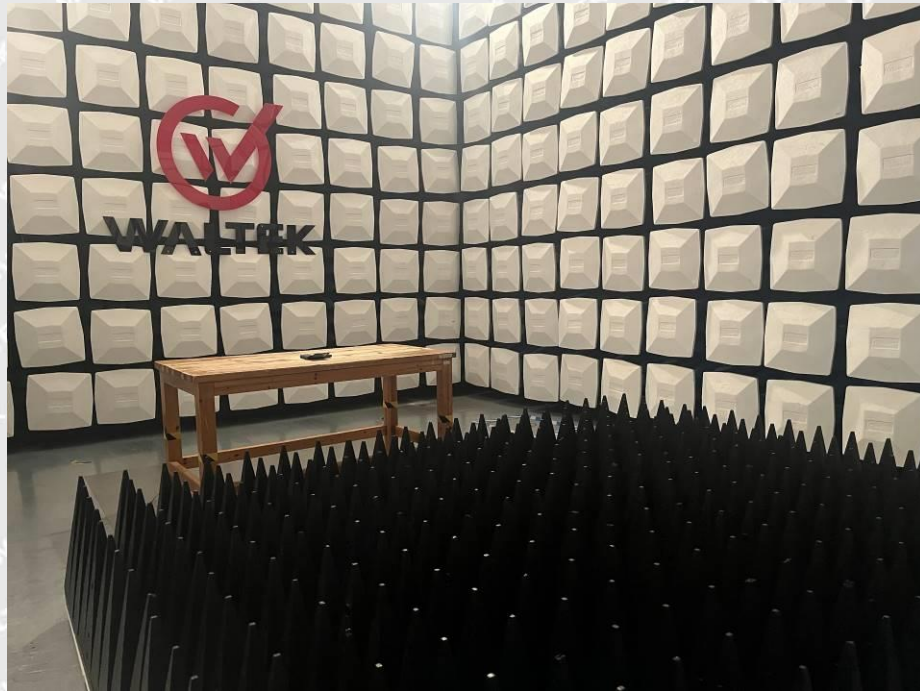


Above 1000MHz





## 7.2 Photograph - RF Electromagnetic Field Test Setup



## 7.3 Photograph - ESD Test Setup





## 8 Photographs – EUT Constructional Details

Please refer to “ANNEX” (Reference No. WTF25F07173499W).

====End of Report=====

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中国认可  
国际互认  
检测  
TESTING  
CNAS L6478



# TEST REPORT

**Reference No.**..... : WTF25F07173500W  
**Applicant**..... : Mid Ocean Brands B.V.  
**Address**..... : Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan,  
Kowloon, Hong Kong.  
**Manufacturer** ..... : 111033  
**Address**..... : ---  
**Product Name**..... : Apple Find My luggage tag, Smart Apple Find My PU wallet  
**Model No.**..... : MO2599, MO2697  
**Test specification**..... : EN 55032:2015+A11:2020+A1:2020  
EN 55035:2017+A11:2020  
**Date of Receipt sample** .... : 2025-07-21  
**Date of Test** ..... : 2025-07-23 to 2025-07-25  
**Date of Issue**..... : 2025-07-31  
**Test Report Form No.** ..... : WEI-55032A-04B  
**Test Result**..... : **Pass**

**Remarks:**

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

**Prepared By:**

**Waltek Testing Group (Foshan) Co., Ltd.**

Address: 1/F., Building 19, Sunlink Machinery City, Xingye 4 Road,  
Guanglong Industrial Park, Chihua Neighborhood Committee, Chencun,  
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Tested by:

Roy Hong

Approved by:

Danny Zhou





## 1 Test Summary

| EMISSION   |                                |   |                      |        |
|--|--------------------------------|---|----------------------|--------|
| Test Item  | Test Standard                  | Class / Severity                          | Result               |        |
| Mains Terminal Disturbance Voltage, 150kHz to 30MHz  | EN 55032:2015+A11:2020+A1:2020 | Table A.10                                | N/A                  |        |
| Radiated Emission, 30MHz to 1000MHz                  | EN 55032:2015+A11:2020+A1:2020 | Table A.4                                 | Pass                 |        |
| Radiation Emission, 1GHz to 6GHz                     | EN 55032:2015+A11:2020+A1:2020 | Table A.5                                 | Pass                 |        |
| IMMUNITY (EN 55035:2017+A11:2020)                    |                                |   |                      |        |
| Test Item  | Test Method                    | Class / Severity                          | Performance Criteria | Result |
| Electrostatic Discharge(ESD)                         | IEC 61000-4-2:2008             | ±4 Kv Contact<br>±8 Kv Air                | B                    | Pass   |
| Continuous RF Electromagnetic Field Disturbances     | IEC 61000-4-3: 2006+A1+A2      | 3V/m, 80%, 1kHz, Amp. Mod.                | A                    | Pass   |
| Electrical Fast Transients (EFT)                     | IEC 61000-4-4:2012             | AC ±1.0Kv<br>DC ±0.5Kv                    | B                    | N/A    |
| Surge  | IEC 61000-4-5:2005             | ±1Kv D.M.†<br>±2Kv C.M.‡                  | B                    | N/A    |
| Continuous Induced RF Disturbances, 0.15MHz to 10MHz | IEC 61000-4-6:2008             | 3Vr.m.s.(emf), 80%,<br>1kHz Amp. Mod.     | A                    | N/A    |
| Continuous Induced RF Disturbances, 10MHz to 30MHz   |                                | 3 to 1Vr.m.s.(emf), 80%,<br>1kHz Amp. Mod | A                    |        |
| Continuous Induced RF Disturbances, 30MHz to 80MHz   |                                | 1Vr.m.s.(emf), 80%,<br>1kHz Amp. Mod      | A                    |        |
| Power-Frequency Magnetic Field                       | IEC 61000-4-8:2009             | 1A/m                                      | A                    | N/A    |
| Voltage Dips   | IEC 61000-4-11:2004            | < 5 % U <sub>T</sub> * for 0.5per         | B                    | N/A    |
| Voltage Interruptions                                |                                | 70 % U <sub>T</sub> * for 25/30per        | C                    |        |
|  |                                | < 5 % U <sub>T</sub> * for 250/300per     | C                    |        |

Remark:

Pass Test item meets the requirement

Fail Test item does not meet the requirement

N/A Test case does not apply to the test object

A.M Amplitude Modulation

† Differential Mode

‡ Common Mode

\* U<sub>T</sub> is the nominal supply voltage



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### 3 General Information

#### 3.1 General Description of E.U.T.

**Product Name** ..... : Apple Find My luggage tag, Smart Apple Find My PU wallet  
**Model No.** ..... : MO2599, MO2697  
**Remark** ..... : Two models have same electric circuit and PCB layout except appearance and function. Therefore the full tests were performed on model MO2697.

#### 3.2 Details of E.U.T.

**Technical Data** ..... : Battery 3.7V  
Wireless input: 2.5W

#### 3.3 Description of Support Units

The EUT has been tested as an independent unit. MO2697 is the test sample. The full tests were performed in the condition of battery 3.7V input.

#### 3.4 Standards Applicable for Testing

The tests were performed according to following standards:

|                                    |  |
|------------------------------------|--|
| EN 55032:2015+A11:2020<br>+A1:2020 | Electromagnetic compatibility of multimedia equipment —<br>Emission Requirements |
| EN 55035:2017+A11:2020             | Electromagnetic compatibility of multimedia equipment - Immunity<br>requirements |

#### 3.5 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 820106.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



### 3.6 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

Yes  No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

### 3.7 Abnormalities from Standard Conditions

None.

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#### 4 Equipment Used during Test

| <input type="checkbox"/> Mains Terminal Disturbance Voltage (Conducted Emission) 1# |                          |                         |                     |              |                    |
|---|--------------------------|-------------------------|---------------------|--------------|--------------------|
| Item  | Equipment                | Manufacturer            | Model No.           | Serial No.   | Calibration Status |
| 1.  | EMI Test Receiver        | R&S                     | ESR3                | 102423       | Valid              |
| 2.  | LISN                     | R&S                     | ENV216              | 101343       | Valid              |
| 3.  | Cable 7                  | HUBER+SUHNER            | CBL2-NN-6M          | 223NN624     | Valid              |
| 4.  | Switch                   | CD                      | RSU-A4 18G          | RSUA4008     | Valid              |
| <input type="checkbox"/> Mains Terminal Disturbance Voltage (Conducted Emission) 1# |                          |                         |                     |              |                    |
| Item  | Equipment                | Manufacturer            | Model No.           | Serial No.   | Calibration Status |
| 1.  | EMI Test Receiver        | R&S                     | ESCI                | 101178       | Valid              |
| 2.  | LISN                     | R&S                     | ENV216              | 101215       | Valid              |
| 3.  | Cable 22                 | Times Microwave Systems | LMR195UF-BMNM-5.00M | ---          | Valid              |
| 4.  | Switch                   | ESE                     | RSU/M2              | ---          | Valid              |
| <input type="checkbox"/> Mains Terminal Disturbance Voltage (Conducted Emission) 1# |                          |                         |                     |              |                    |
| Item  | Equipment                | Manufacturer            | Model No.           | Serial No.   | Calibration Status |
| 1.  | EMI Test Receiver        | R&S                     | ESR3                | 102842       | Valid              |
| 2.  | LISN                     | R&S                     | ENV216              | 101542       | Valid              |
| 3.  | Cable 12                 | YIHENG                  | LMR195UF-NMNM-2.5   | ---          | Valid              |
| 4.  | Manual RF Switch         | Top Precision           | SW-2                | RSU0402      | Valid              |
| <input type="checkbox"/> Radiated Emission (30MHz to 1GHz) 1#                       |                          |                         |                     |              |                    |
| Item  | Equipment                | Manufacturer            | Model No.           | Serial No.   | Calibration Status |
| 1.  | 3m Semi-anechoic Chamber | CHANGCHUANG             | 9m×6m×6m            | ---          | Valid              |
| 2.  | EMI Test Receiver        | R&S                     | ESR7                | 101566       | Valid              |
| 3.  | Trilog Broadband Antenna | SCHWARZBECK             | VULB 9162           | 9162-117     | Valid              |
| 4.  | Cable 20                 | Times Microwave Systems | RG223-NMNM-10M      | ---          | Valid              |
| 5.  | Cable 21                 | Times Microwave Systems | RG223-NMNM-3M       | ---          | Valid              |
| <input checked="" type="checkbox"/> Radiated Emission (30MHz to 1GHz) 2#            |                          |                         |                     |              |                    |
| Item  | Equipment                | Manufacturer            | Model No.           | Serial No.   | Calibration Status |
| 1.  | 3m Semi-anechoic Chamber | YIHENG                  | 9m×6m×6m            | YH2021071801 | Valid              |
| 2.  | EMI Test Receiver        | R&S                     | ESR7                | 102454       | Valid              |
| 3.  | Trilog Broadband Antenna | SCHWARZBECK             | VULB 9163           | 01418        | Valid              |
| 4.  | Cable 14                 | YIHENG                  | LMR240UF-NMSM-7.5   | ---          | Valid              |



| <input checked="" type="checkbox"/> Radiated Emission (1GHz to 6GHz) 1#    |                                |                         |                   |              |                    |
|--|--------------------------------|-------------------------|-------------------|--------------|--------------------|
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | 3m Semi-anechoic Chamber       | CHANGCHUANG             | 9m×6m×6m          | -            | Valid              |
| 2.   | EMI Test Receiver              | R&S                     | ESR7              | 101566       | Valid              |
| 3.   | Broad-band Horn Antenna        | SCHWARZBECK             | BBHA 9120 D       | 01561        | Valid              |
| 4.   | Coaxial Cable (above 1GHz)     | Times-Microwave         | CBL5-NN           | -            | Valid              |
| 5.   | Preamplifier                   | Lunar E M               | LNA1G18-40        | 20160501002  | Valid              |
| <input type="checkbox"/> Radiated Emission (1GHz to 6GHz) 1#               |                                |                         |                   |              |                    |
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | 3m Semi-anechoic Chamber       | YIHENG                  | 9m×6m×6m          | YH2021071801 | Valid              |
| 2.   | EMI Test Receiver              | R&S                     | ESR7              | 102454       | Valid              |
| 3.   | Broad-band Horn Antenna        | SCHWARZBECK             | BBHA9120D         | 02465        | Valid              |
| 4.   | Coaxial Cable (above 1GHz)     | Times-Microwave Systems | SFT205-NMSM-7     | -            | Valid              |
| 5.   | Preamplifier                   | Tonscend                | TAP0118045        | AP21J806168  | Valid              |
| <input checked="" type="checkbox"/> ESD                                    |                                |                         |                   |              |                    |
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | ESD Simulator                  | TESEQ                   | NSG437            | 521          | Valid              |
| <input type="checkbox"/> EFT & Voltage Dips and Interruptions              |                                |                         |                   |              |                    |
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | EMS test system                | TESEQ                   | NSG3040           | 1858         | Valid              |
| 2.   | Step transformer               | TESEQ                   | INA6501           | 206          | Valid              |
| 3.   | Coupling clamp                 | TESEQ                   | CDN8014           | 31405        | Valid              |
| <input type="checkbox"/> Surge   |                                |                         |                   |              |                    |
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | Surge Simulator                | TESEQ                   | NSG3060           | 1395         | Valid              |
| <input type="checkbox"/> Injected Currents                                 |                                |                         |                   |              |                    |
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | Conducted Immunity test system | TESEQ                   | NSG4070           | 45345        | Valid              |
| 2.   | CDN                            | TESEQ                   | CDN M016          | 31586        | Valid              |
| 3.   | EM Clamp                       | TESEQ                   | KEMZ801           | 32362        | Valid              |
| 4.   | 6dB Attenuator                 | TESEQ                   | ATN6075           | 32122        | Valid              |
| <input checked="" type="checkbox"/> Radio-frequency Electromagnetic Fields |                                |                         |                   |              |                    |
| Item   | Equipment                      | Manufacturer            | Model No.         | Serial No.   | Calibration Status |
| 1.   | RF Power Amplifier             | MICOTOP                 | MPA-80-1000-250   | MPA2405139   | Valid              |
| 2.   | RF Power Amplifier             | MICOTOP                 | MPA-1000-6000-100 | MPA2405140   | Valid              |



|    |   |             |                   |        |       |
|----|---|-------------|-------------------|--------|-------|
| 3. | Stacked double logarithmic periodic antenna | SCHWARZBECK | STLP9128E-SPECIAL | 142    | Valid |
| 4. | Stacked double logarithmic periodic antenna | SCHWARZBECK | STLP 9149         | 476    | Valid |
| 5. | Analog signal generator                     | RS          | SMB100A           | 105566 | Valid |
| 6. | Power meter                                 | RS          | NRP6A             | 101133 | Valid |
| 7. | Power meter                                 | RS          | NRP6A             | 101134 | Valid |

: Not Used

: Used

#### 4.1 Software List

| Description                                  | Manufacturer | Model   | Version        |
|--|--------------|---------|----------------|
| EMI Test Software<br>(Conducted Emission 1#) | FARATRONIC   | EZ-EMC  | EMEC-3A1       |
| EMI Test Software<br>(Conducted Emission 2#) | FARATRONIC   | EZ-CON  | FARAD-3A1.1+   |
| EMI Test Software<br>(Conducted Emission 3#) | FARATRONIC   | EZ-EMC  | EMC-CON 3A1.1+ |
| EMI Test Software<br>(Radiated Emission 1#)  | FARATRONIC   | EZ-EMC  | RA-03A1-2      |
| EMI Test Software<br>(Radiated Emission 2#)  | FARATRONIC   | EZ-EMC  | RA-03A1-2      |
| Radiated Immunity Test Software              | TONSCEND     | JS35-RS | V2.0.1.7       |

#### 4.2 Measurement Uncertainty

| Test Item          | Frequency Range | Uncertainty | Note |
|--------------------|-----------------|-------------|------|
| Conducted Emission | 150kHz~30MHz    | ±2.6dB      | (1)  |
| Radiated Emission  | 30MHz~1GHz      | ±4.5dB      | (1)  |
| Radiated Emission  | 1GHz~6GHz       | ±4.5dB      | (1)  |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .



### 4.3 Special Accessories and Auxiliary Equipment

| Item | Equipment | Technical Data | Manufacturer | Model No. | Serial No. |
|------|-----------|----------------|--------------|-----------|------------|
| 1.   | /         | /              | /            | /         | /          |

### 4.4 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If  $U_{LAB}$  is less than or equal to  $U_{cispr}$ , then

-Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;

-Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{LAB}$  is greater than  $U_{cispr}$ , then

-Compliance is deemed to occur if no measured disturbance level, increased by  $(U_{LAB} - U_{cispr})$ , exceeds the disturbance limit;

-Non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{LAB} - U_{cispr})$ , exceeds the disturbance limit.

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## 5 Emission Test Results

### 5.1 Radiated Emission, 30MHz to 1GHz

|                        |                         |
|------------------------|-------------------------|
| Test Requirement ..... | : EN 55032 Annex A.2    |
| Test Method .....      | : EN 55032 Annex A.2    |
| Test Limit.....        | : Table A.4 of EN 55032 |
| Test Result .....      | : Pass                  |
| Frequency Range .....  | : 30MHz to 1000MHz      |
| Class.....             | : Class B               |

#### 5.1.1 E.U.T. Operation

##### Operating Environment:

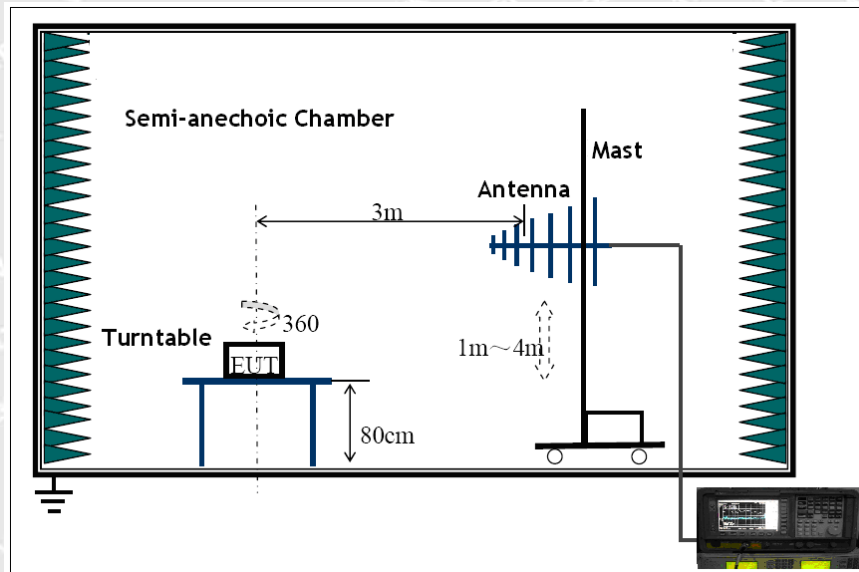
|                            |            |
|----------------------------|------------|
| Temperature.....           | : 22.6°C   |
| Humidity .....             | : 50.9%RH  |
| Atmospheric Pressure ..... | : 101.2kPa |

##### EUT Operation:

|                      |                |
|----------------------|----------------|
| Input Voltage.....   | : Battery 3.7V |
| Operating Mode ..... | : Working mode |

#### 5.1.2 Block Diagram of Test Setup

The Radiated Emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the CISPR 16-2-3.



#### 5.1.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for EUT 0°-360°. Quasi-peak measurements were performed if peak emissions were within 6dB of the limit line.



### 5.1.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Corr. Factor}$$

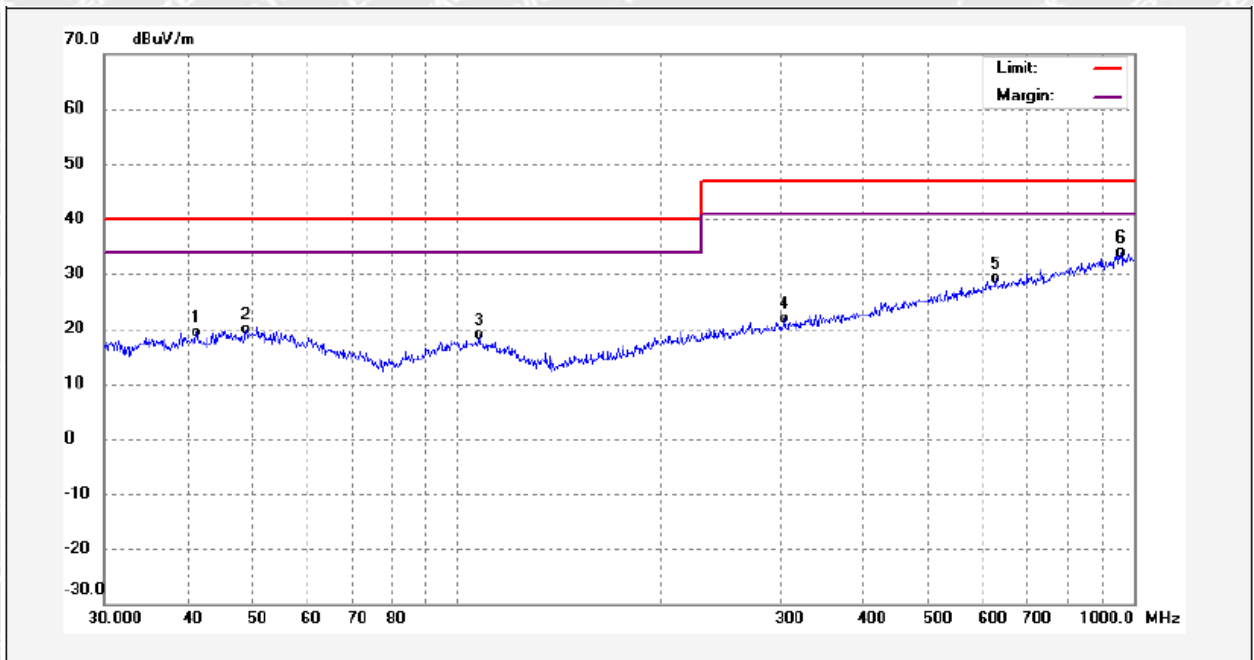
$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

### 5.1.5 Radiated Emission Test Data

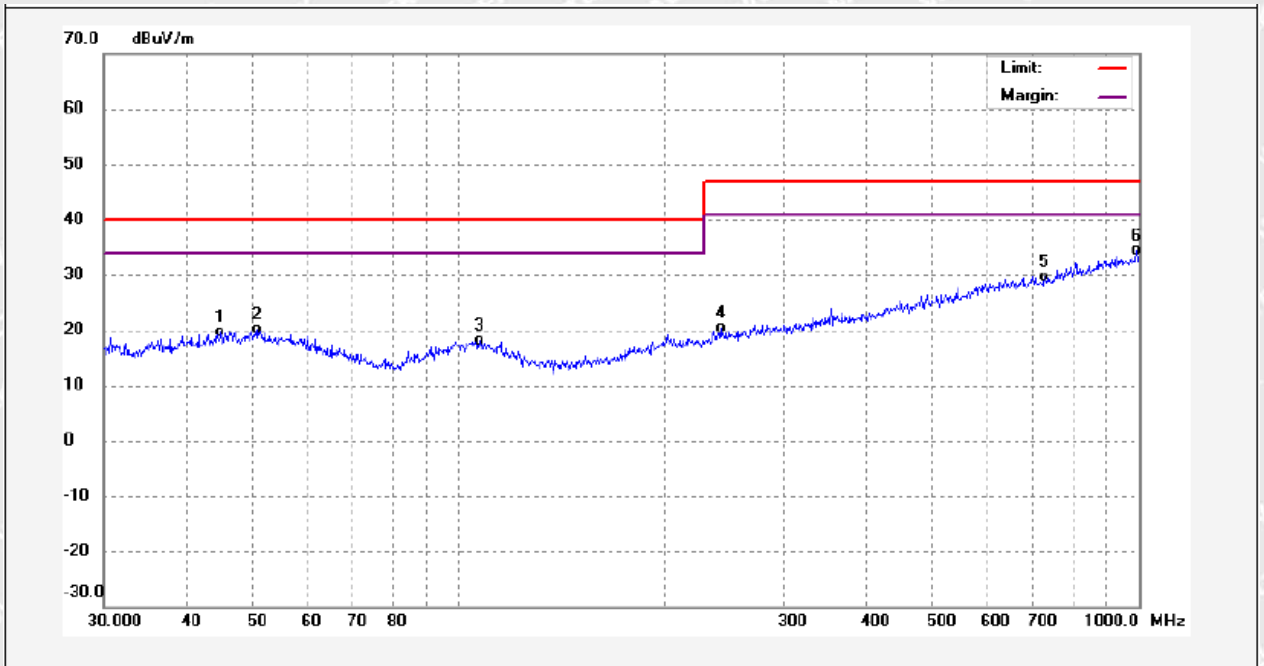
#### Vertical Polarization



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 41.2186     | 0.50             | 18.83       | 19.33           | 40.00          | -20.67      | QP       |        |
| 2   | 48.8258     | -0.11            | 19.91       | 19.80           | 40.00          | -20.20      | QP       |        |
| 3   | 107.9634    | 0.74             | 18.16       | 18.90           | 40.00          | -21.10      | QP       |        |
| 4   | 304.8236    | 1.21             | 20.67       | 21.88           | 47.00          | -25.12      | QP       |        |
| 5   | 625.7360    | 1.90             | 27.13       | 29.03           | 47.00          | -17.97      | QP       |        |
| 6   | 955.7732    | 3.28             | 30.60       | 33.88           | 47.00          | -13.12      | QP       |        |



## Horizontal Polarization



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 44.7121     | 0.23             | 19.48       | 19.71           | 40.00          | -20.29      | QP       |        |
| 2   | 50.6925     | 0.32             | 19.87       | 20.19           | 40.00          | -19.81      | QP       |        |
| 3   | 107.2089    | -0.06            | 18.24       | 18.18           | 40.00          | -21.82      | QP       |        |
| 4   | 243.0361    | 1.12             | 19.21       | 20.33           | 47.00          | -26.67      | QP       |        |
| 5   | 725.2777    | 2.05             | 27.69       | 29.74           | 47.00          | -17.26      | QP       |        |
| 6   | 996.4996    | 3.21             | 31.09       | 34.30           | 47.00          | -12.70      | QP       |        |



## 5.2 Radiated Emission, 1GHz to 6GHz

|                        |                         |
|------------------------|-------------------------|
| Test Requirement ..... | : EN 55032 Annex A.2    |
| Test Method .....      | : EN 55032 Annex A.2    |
| Test Limit.....        | : Table A.5 of EN 55032 |
| Test Result .....      | : Pass                  |
| Frequency Range .....  | : 1GHz to 6GHz          |
| Class.....             | : Class B               |

### 5.2.1 E.U.T. Operation

#### Operating Environment:

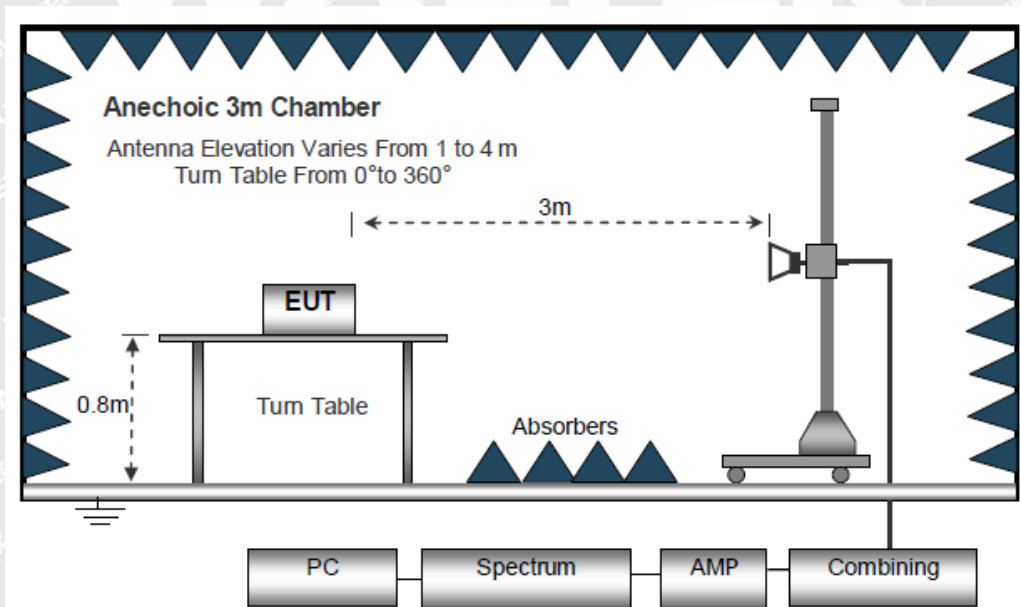
|                            |            |
|----------------------------|------------|
| Temperature.....           | : 22.6°C   |
| Humidity .....             | : 50.9%RH  |
| Atmospheric Pressure ..... | : 101.2kPa |

#### EUT Operation:

|                      |                |
|----------------------|----------------|
| Input Voltage.....   | : Battery 3.7V |
| Operating Mode ..... | : Working mode |

### 5.2.2 Block Diagram of Test Setup

The Radiated Emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the CISPR 16-2-3.



### 5.2.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for EUT 0°-360°. Quasi-peak measurements were performed if peak emissions were within 6dB of the limit line.



### 5.2.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Corr. Factor}$$

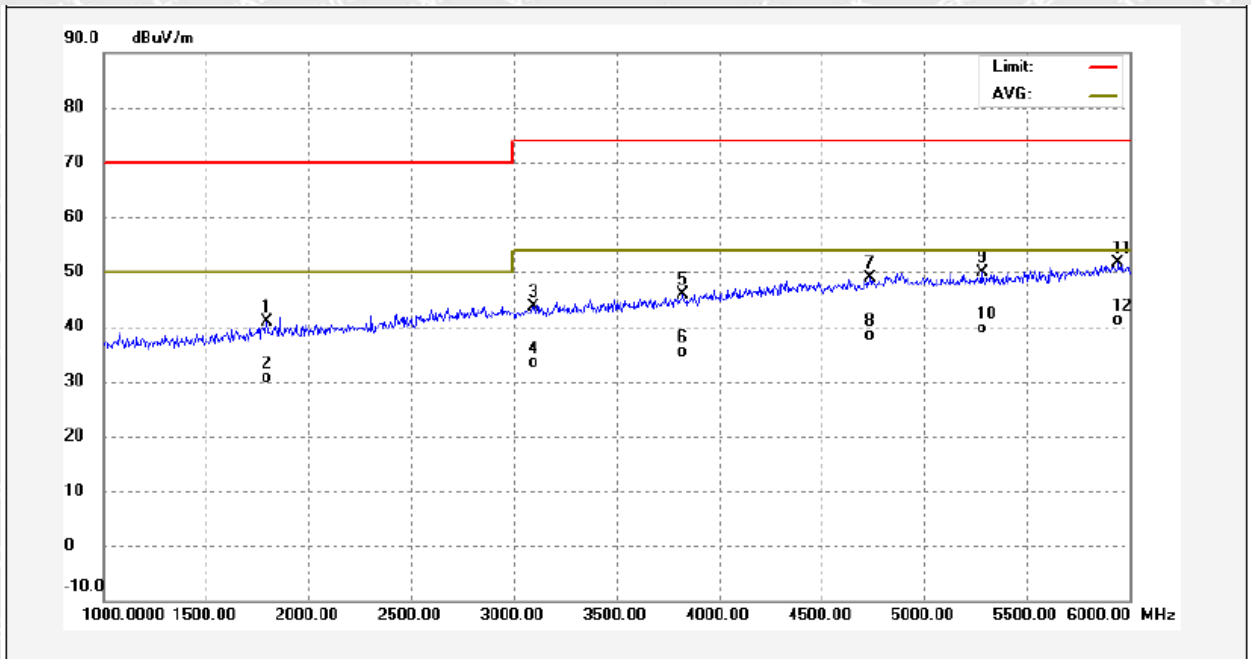
$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

### 5.2.5 Radiated Emission Test Data

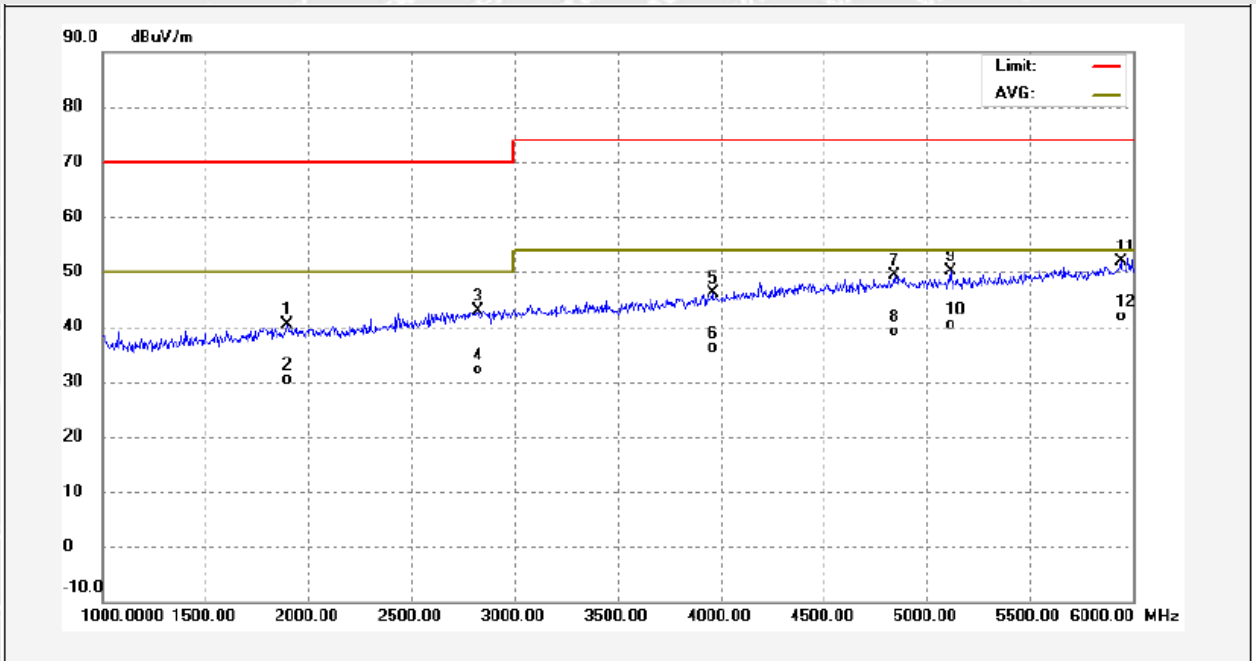
#### Vertical Polarization



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 1799.500    | 11.89            | 28.89       | 40.78           | 70.00          | -29.22      | peak     |        |
| 2   | 1799.500    | 1.65             | 28.89       | 30.54           | 50.00          | -19.46      | AVG      |        |
| 3   | 3095.500    | 11.72            | 31.84       | 43.56           | 74.00          | -30.44      | peak     |        |
| 4   | 3095.500    | 1.44             | 31.84       | 33.28           | 54.00          | -20.72      | AVG      |        |
| 5   | 3829.000    | 12.32            | 33.53       | 45.85           | 74.00          | -28.15      | peak     |        |
| 6   | 3829.000    | 1.87             | 33.53       | 35.40           | 54.00          | -18.60      | AVG      |        |
| 7   | 4735.000    | 13.43            | 35.33       | 48.76           | 74.00          | -25.24      | peak     |        |
| 8   | 4735.000    | 3.09             | 35.33       | 38.42           | 54.00          | -15.58      | AVG      |        |
| 9   | 5282.500    | 13.64            | 36.29       | 49.93           | 74.00          | -24.07      | peak     |        |
| 10  | 5282.500    | 3.30             | 36.29       | 39.59           | 54.00          | -14.41      | AVG      |        |
| 11  | 5946.000    | 14.39            | 37.33       | 51.72           | 74.00          | -22.28      | peak     |        |
| 12  | 5946.000    | 3.76             | 37.33       | 41.09           | 54.00          | -12.91      | AVG      |        |



**Horizontal Polarization**



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|-----|-------------|------------------|-------------|-----------------|----------------|-------------|----------|--------|
| 1   | 1896.000    | 11.37            | 29.05       | 40.42           | 70.00          | -29.58      | peak     |        |
| 2   | 1896.000    | 1.28             | 29.05       | 30.33           | 50.00          | -19.67      | AVG      |        |
| 3   | 2828.500    | 11.83            | 31.15       | 42.98           | 70.00          | -27.02      | peak     |        |
| 4   | 2828.500    | 1.00             | 31.15       | 32.15           | 50.00          | -17.85      | AVG      |        |
| 5   | 3963.000    | 12.01            | 34.05       | 46.06           | 74.00          | -27.94      | peak     |        |
| 6   | 3963.000    | 2.15             | 34.05       | 36.20           | 54.00          | -17.80      | AVG      |        |
| 7   | 4846.000    | 13.69            | 35.61       | 49.30           | 74.00          | -24.70      | peak     |        |
| 8   | 4846.000    | 3.57             | 35.61       | 39.18           | 54.00          | -14.82      | AVG      |        |
| 9   | 5118.500    | 13.91            | 36.12       | 50.03           | 74.00          | -23.97      | peak     |        |
| 10  | 5118.500    | 4.16             | 36.12       | 40.28           | 54.00          | -13.72      | AVG      |        |
| 11  | 5941.000    | 14.65            | 37.32       | 51.97           | 74.00          | -22.03      | peak     |        |
| 12  | 5941.000    | 4.53             | 37.32       | 41.85           | 54.00          | -12.15      | AVG      |        |



## 6 Immunity Test Results

### 6.1 Performance Criteria

**Performance criterion A:** The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

**Performance criterion B:** After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test

**Performance criterion C:** Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

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## 6.2 Electrostatic Discharge (ESD)

|                           |   |
|---------------------------|---|
| Test Requirement .....    | : EN 55035  |
| Test Method .....         | : IEC 61000-4-2   |
| Test Result .....         | : Pass  |
| Discharge Impedance ..... | : 330Ω / 150pF  |
| Discharge Voltage .....   | : Air Discharge: ±8kV<br>Contact Discharge: ±4kV<br>HCP & VCP: ±4kV |
| Polarity .....            | : Positive & Negative   |
| Number of Discharge ..... | : Minimum 10 times at each test point                               |
| Discharge Mode .....      | : Single Discharge  |
| Discharge Period .....    | : 1 second minimum  |

### 6.2.1 E.U.T. Operation

#### Operating Environment:

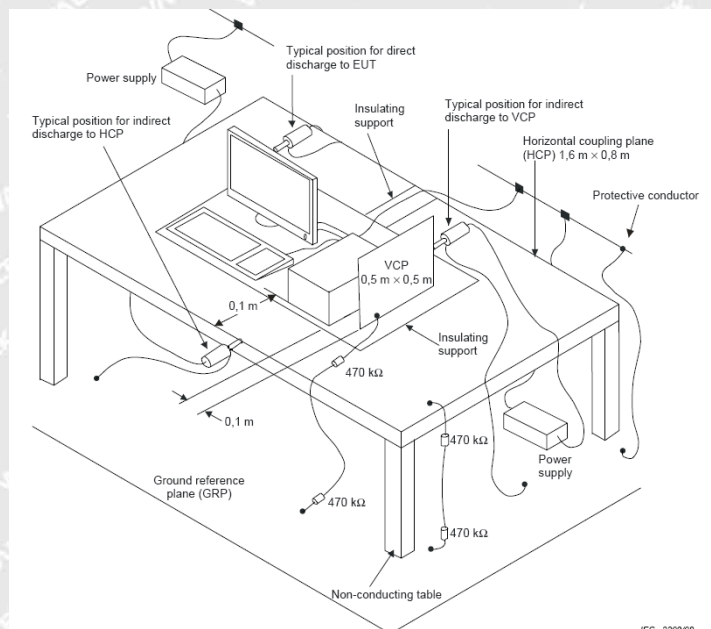
|                           |            |
|---------------------------|------------|
| Temperature .....         | : 22.9°C   |
| Humidity .....            | : 51.1%RH  |
| Barometric Pressure ..... | : 101.3kPa |

#### EUT Operation:

|                      |                |
|----------------------|----------------|
| Input Voltage .....  | : Battery 3.7V |
| Operating Mode ..... | : Working mode |

### 6.2.2 Block Diagram of Setup

The ESD test was performed in accordance with the IEC 61000-4-2.







### 6.2.3 Direct Discharge Test Results

**Observations:** **Test points:** 1. All Exposed Surface & Seams;  
2. All metallic part

| Direct Discharge     |                       |            | Test Results      |               |
|----------------------|-----------------------|------------|-------------------|---------------|
| Applied Voltage (kV) | Performance Criterion | Test Point | Contact Discharge | Air Discharge |
| ±8                   | B                     | 1          | N/A               | Pass*         |
| ±4                   | B                     | 2          | Pass*             | N/A           |

Remark:

\* During the test no deviation was detected to the selected operation mode(s)

### 6.2.4 Indirect Discharge Test Results

**Observations:** **Test points:** 1. All sides.

| Indirect Discharge   |                       |            | Test Results        |                   |
|----------------------|-----------------------|------------|---------------------|-------------------|
| Applied Voltage (kV) | Performance Criterion | Test Point | Horizontal Coupling | Vertical Coupling |
| ±4                   | B                     | 1          | Pass*               | Pass*             |

Remark:

\* During the test no deviation was detected to the selected operation mode(s)



### 6.3 Continuous RF Electromagnetic Field Disturbances

|                           |  |
|---------------------------|--|
| Test Requirement .....    | : EN 55035   |
| Test Method .....         | : IEC 61000-4-3  |
| Test Result .....         | : Pass   |
| Frequency Range .....     | : 80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz |
| Test level .....          | : 3V/m   |
| Modulation .....          | : 80%, 1kHz Amplitude Modulation.                      |
| Face of EUT.....          | : Front, Back, Left, Right                             |
| Antenna polarisation..... | : Horizontal & Vertical                                |
| Test Distance .....       | : 3m   |

#### 6.3.1 E.U.T. Operation

##### Operating Environment:

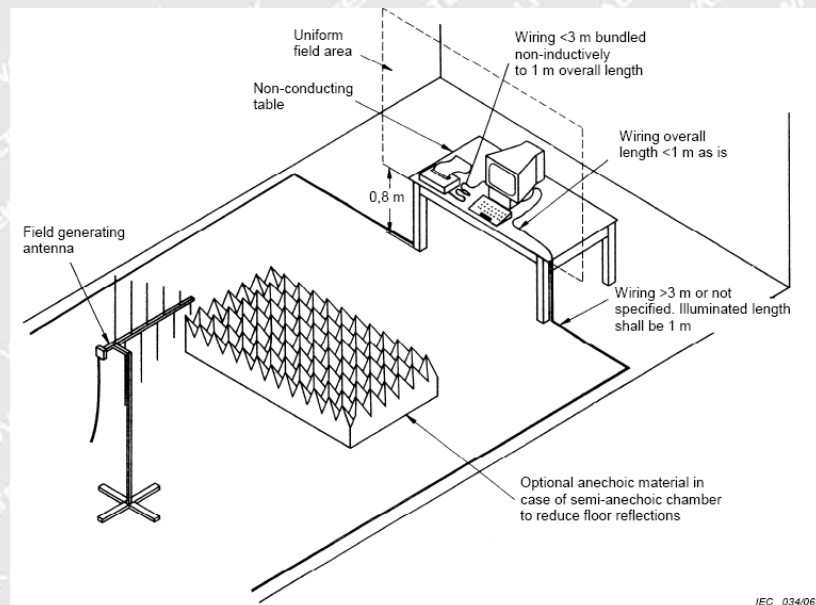
|                           |            |
|---------------------------|------------|
| Temperature.....          | : 23.3°C   |
| Humidity .....            | : 51.4%RH  |
| Barometric Pressure ..... | : 101.5kPa |

##### EUT Operation:

|                      |                |
|----------------------|----------------|
| Input Voltage.....   | : Battery 3.7V |
| Operating Mode ..... | : Working mode |

#### 6.3.2 Block Diagram of Setup

The Radio-frequency electromagnetic fields Immunity test was performed in accordance with the IEC 61000-4-3.





### 6.3.3 Test Results

| Frequency     | Face of EUT              | Antenna polarisation | Test Level | Step Size | Dwell Time | Performance Criterion | Result |
|---------------|--------------------------|----------------------|------------|-----------|------------|-----------------------|--------|
| 80 to 1000MHz | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 80 to 1000MHz | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 1800MHz       | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 1800MHz       | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 2600MHz       | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 2600MHz       | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 3500MHz       | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 3500MHz       | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 5000MHz       | Front, Back, Left, Right | Horizontal           | 3V/m       | 1%        | 1s         | A                     | Pass*  |
| 5000MHz       | Front, Back, Left, Right | Vertical             | 3V/m       | 1%        | 1s         | A                     | Pass*  |

Remark:

- \* During the test no deviation was detected to the selected operation mode(s)

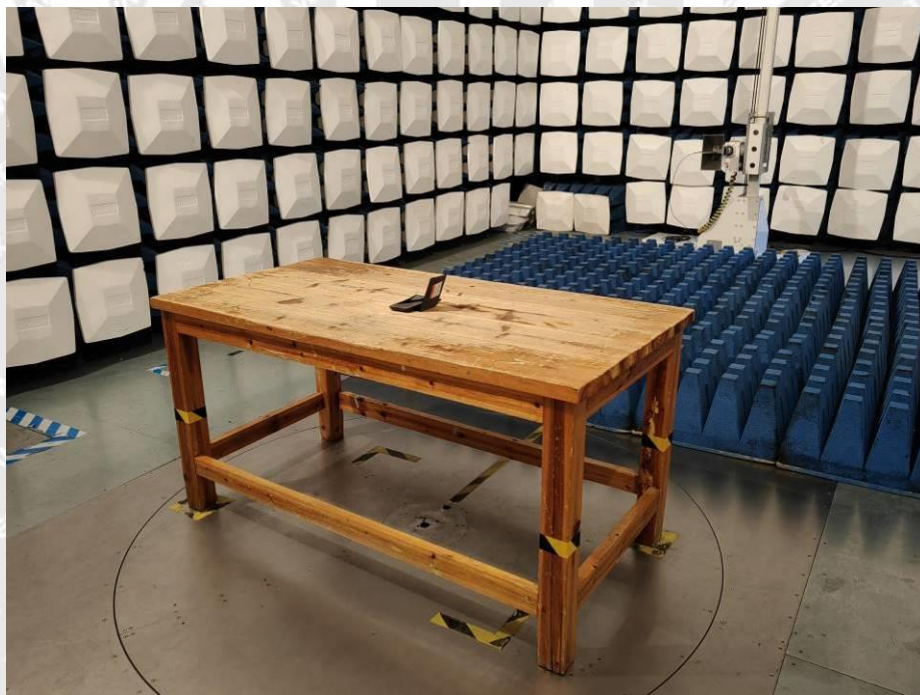


## 7 Photographs – Test Setup

### 7.1 Photograph – Radiated Emission Test Setup, 30MHz to 1GHz



### 7.2 Photograph – Radiated Emission Test Setup, 1GHz to 6GHz

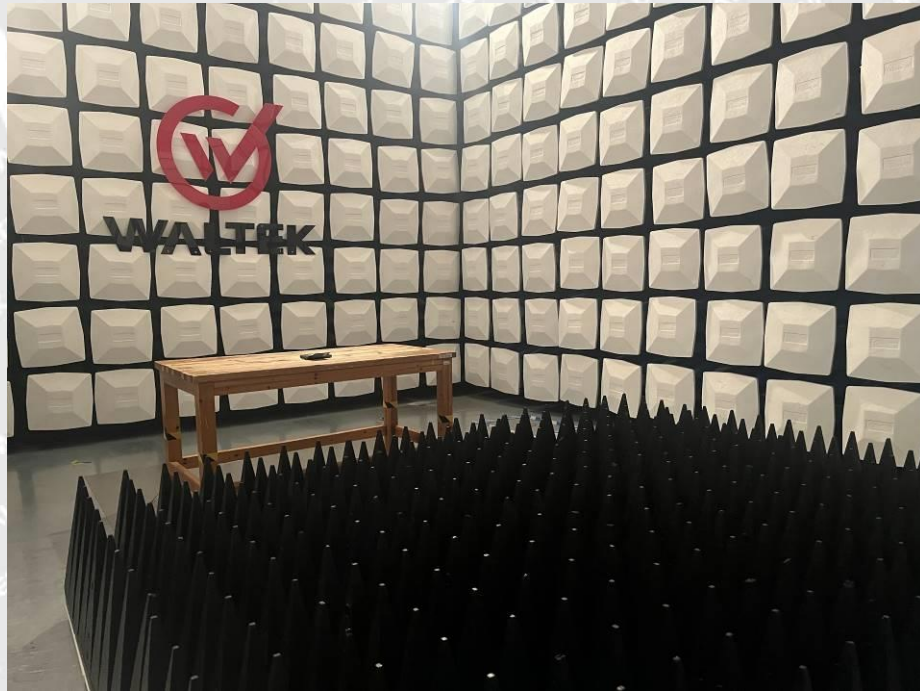




### 7.3 Photograph – ESD Immunity Test Setup



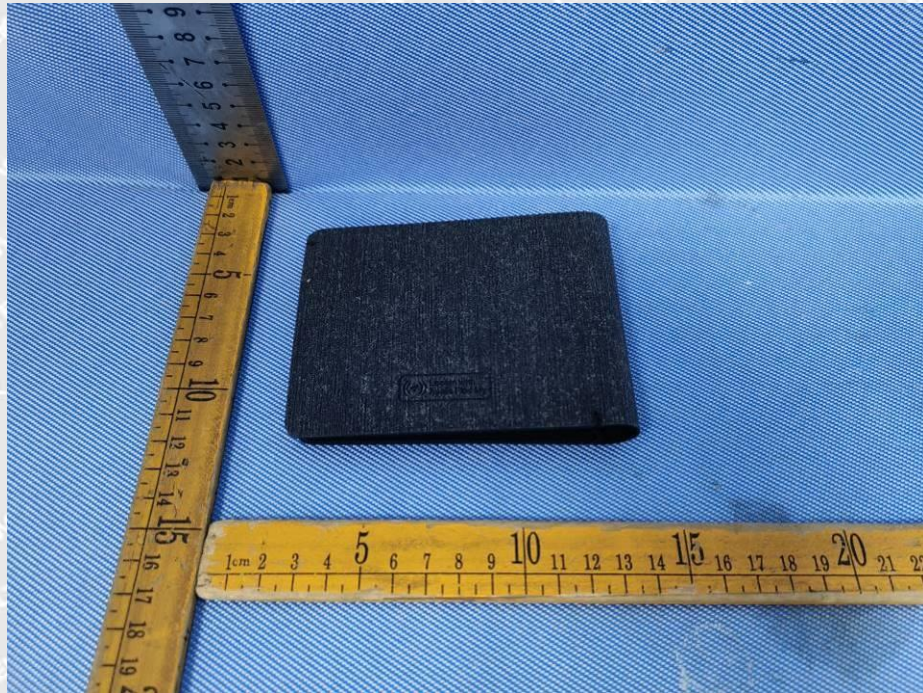
### 7.4 Photograph – Continuous RF Electromagnetic Field Disturbances Test Setup





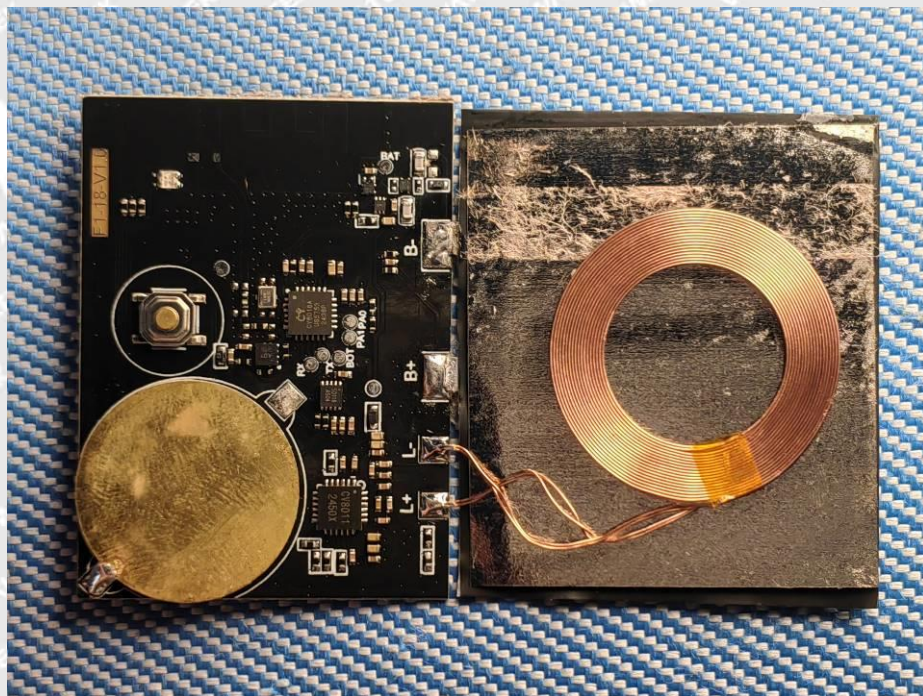
## 8 Photographs – Constructional Details

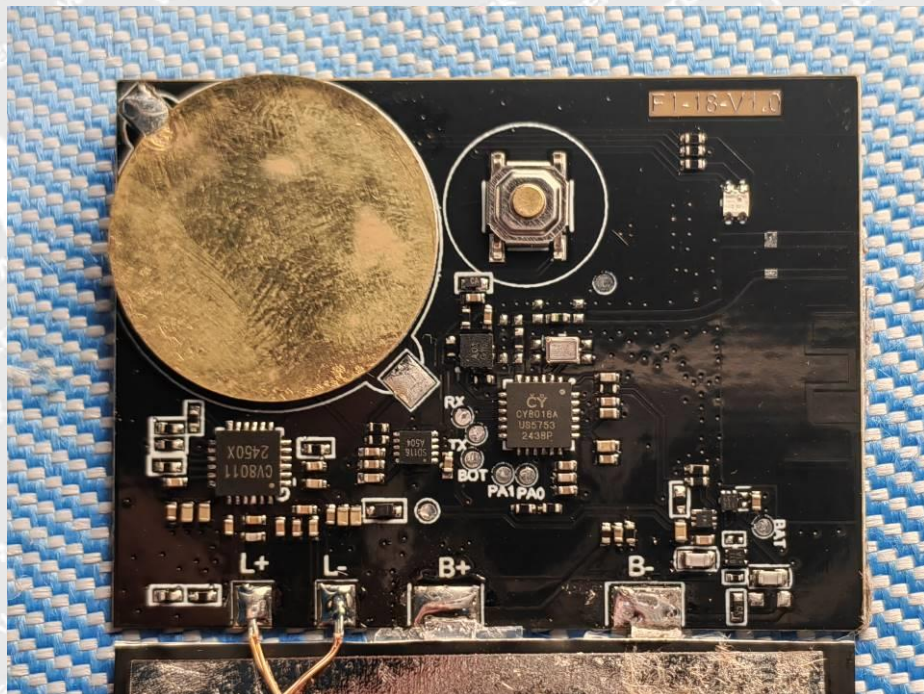
### 8.1 EUT – External Photos





## 8.2 EUT – Internal Photos





===== End of Report =====