



中国认可
国际互认
检测
TESTING
CNAS L6478



TEST REPORT

Reference No..... : WTF23F01004628E
 Applicant..... : Mid Ocean Brands B.V.
 Address..... : 7/F., Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon,
 Hong Kong
 Manufacturer : 116737
 Address..... : ---
 Product Name..... : 12 digit bamboo calculator
 Model No..... : MO6216
 Test specification..... : EN 55032:2015+A11:2020+A1:2020
 EN 55035:2017+A11:2020
 Date of Receipt sample : 2023-02-02
 Date of Test..... : 2023-02-02 to 2023-02-03
 Date of Issue..... : 2023-02-06
 Test Report Form No. : WEI-55032A-05A
 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:

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1 Test Summary

EMISSION				
Test Item	Test Standard	Class / Severity	Result	
Radiated Emission, 30MHz to 1000MHz	EN 55032:2015+A11:2020+A1:2020	Table A.4	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 ±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

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

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3 General Information

3.1 General Description of E.U.T.

Product Name : 12 digit bamboo calculator
Model No. : MO6216
Remark : ---

3.2 Details of E.U.T.

Technical Data..... : Battery 1.5V

3.3 Description of Support Units

The EUT has been tested as an independent unit. MO6216 is the test sample. All tests were performed in the condition of battery 1.5V.

3.4 Standards Applicable for Testing

The tests were performed according to following standards:

EN 55032:2015+A11:2020 +A1:2020	Electromagnetic compatibility of multimedia equipment — Emission Requirements
EN 55035:2017+A11:2020	Electromagnetic compatibility of multimedia equipment - Immunity 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, March 12, 2019

- **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, August 16, 2018

- **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

<input checked="" 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.	Coaxial Cable (below 1GHz)	H+S	CBL3-NN-12+3 m	214NN320	Valid
<input type="checkbox"/> Radiated Emission (30MHz to 1GHz) 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	3m Semi-anechoic Chamber	YIHENG	10m×5.3m×3.5m	YH2021071804	Valid
2.	EMI Test Receiver	R&S	ESR7	102454	Valid
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9163	01418	Valid
4.	Coaxial Cable (below 1GHz)	Times-Microwave Systems	LMR240UF-NMSM-7.5	---	Valid
<input 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) 2#					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	3m Semi-anechoic Chamber	YIHENG	10m×5.3m×3.5m	YH2021071804	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 checked="" type="checkbox"/> Radio-frequency Electromagnetic Fields					
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Status
1.	RF Power Amplifier	OPHIR	5225R	1051/1712	Valid
2.	RF Power Amplifier	OPHIR	5293RE	1051/171	Valid
3.	Stacked double logarithmic periodic antenna	SCHWARZBECK	STLP9128E-SPECIAL	142	Valid
4.	Stacked double logarithmic periodic antenna	SCHWARZBECK	STLP 9149	476	Valid
5.	RF signal generator	Agilent	N5181A	MY48180720	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 (Radiated Emission 1#)	FARATRONIC	EZ-EMC	RA-03A1-1
EMI Test Software (Radiated Emission 2#)	FARATRONIC	EZ-EMC	RA-03A1-1
Radiated Immunity Test Software	TONSCEND	JS35-RS	V2.0.1.7

4.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
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, 30 MHz 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:

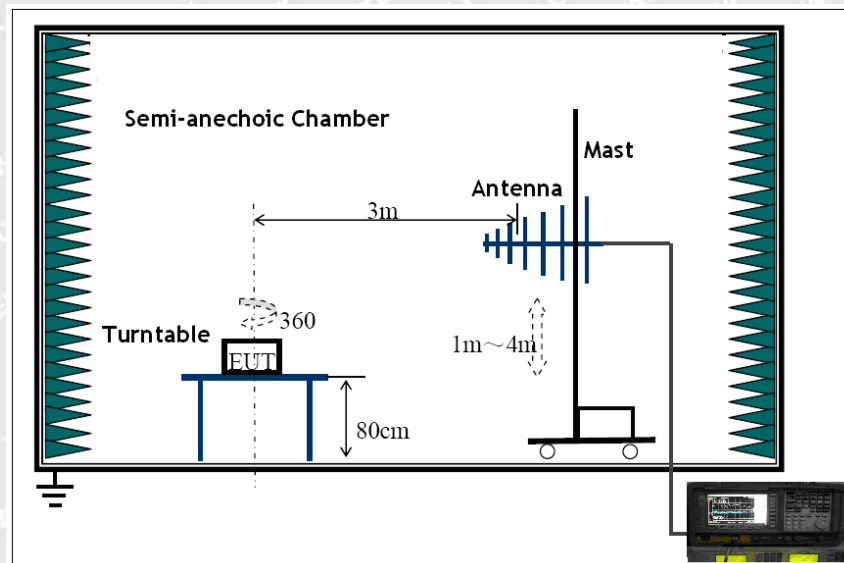
Temperature	: 23.1°C
Humidity	: 51.8%RH
Atmospheric Pressure	: 101.2kPa

EUT Operation:

Input Voltage	: Battery 1.5V
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:

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

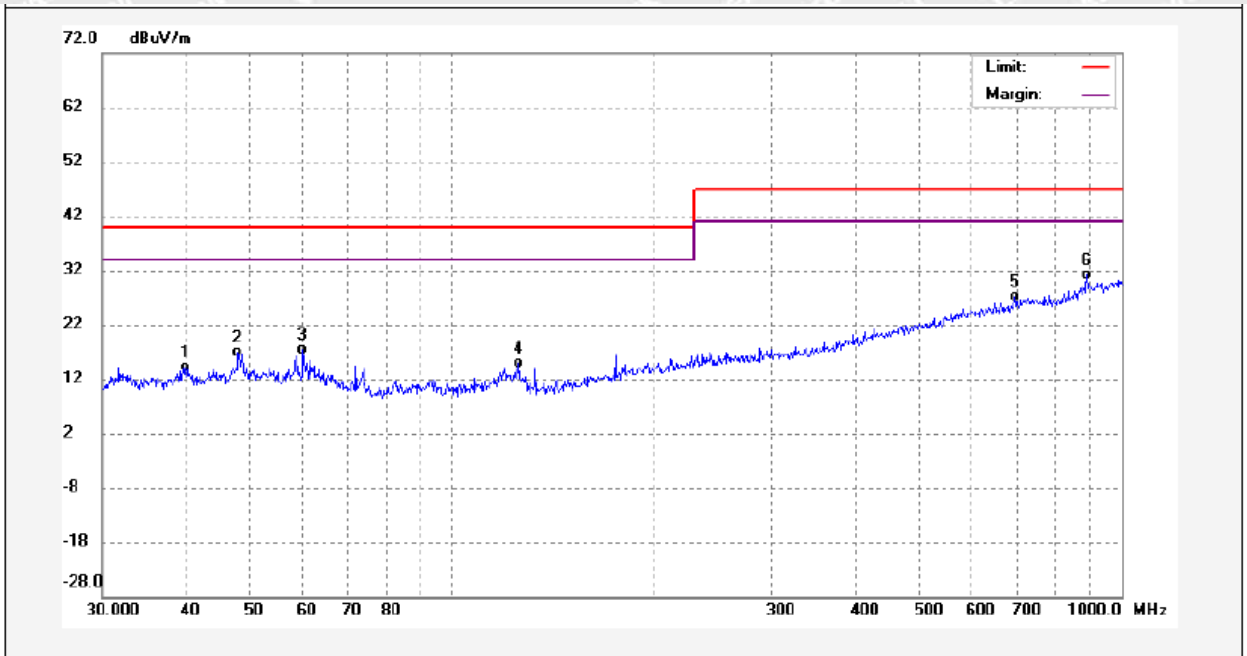
$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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

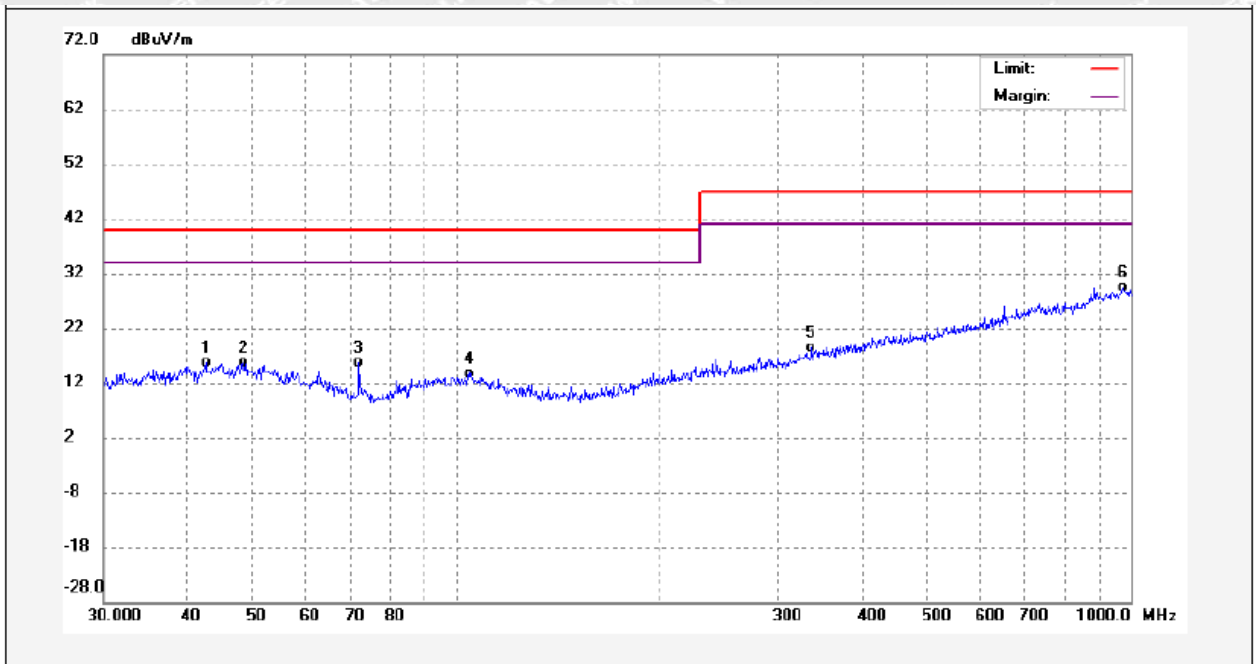
Vertical Polarization:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	40.0644	1.20	12.92	14.12	40.00	-25.88	QP	
2	47.9772	3.20	13.58	16.78	40.00	-23.22	QP	
3	59.9639	4.38	13.08	17.46	40.00	-22.54	QP	
4	126.0189	3.15	11.78	14.93	40.00	-25.07	QP	
5	693.2010	2.56	24.55	27.11	47.00	-19.89	QP	
6	888.5441	3.63	27.39	31.02	47.00	-15.98	QP	



Horizontal Polarization:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	42.6597	0.35	15.23	15.58	40.00	-24.42	QP	
2	48.3318	0.37	15.15	15.52	40.00	-24.48	QP	
3	71.9833	5.40	10.30	15.70	40.00	-24.30	QP	
4	105.2348	-0.42	14.17	13.75	40.00	-26.25	QP	
5	336.2709	1.13	17.32	18.45	47.00	-28.55	QP	
6	973.0195	2.26	27.01	29.27	47.00	-17.73	QP	



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 Contact Discharge: ±4kV 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:

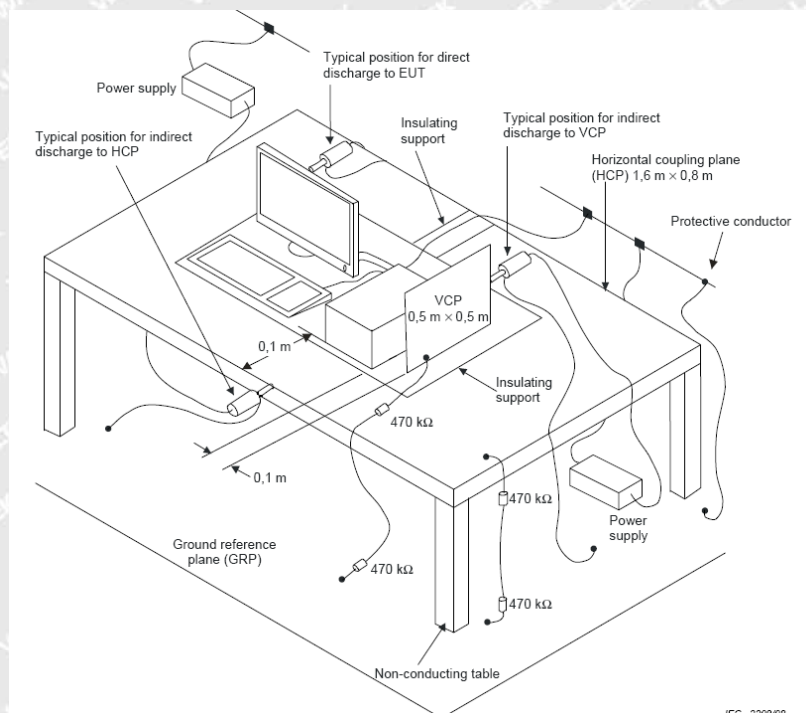
Temperature	:	21.2°C
Humidity	:	51.2%RH
Barometric Pressure	:	100.2kPa

EUT Operation:

Input Voltage	:	Battery 1.5V
Operating Mode	:	On 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:

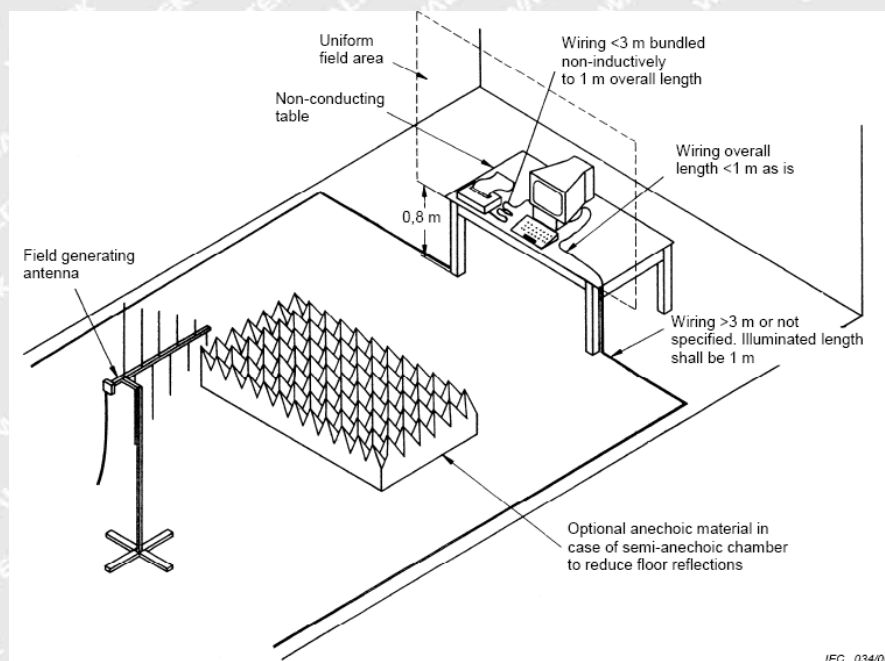
Temperature	: 23.1°C
Humidity	: 51.8%RH
Barometric Pressure	: 101.3kPa

EUT Operation:

Input Voltage	: Battery 1.5V
Operating Mode	: On 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)

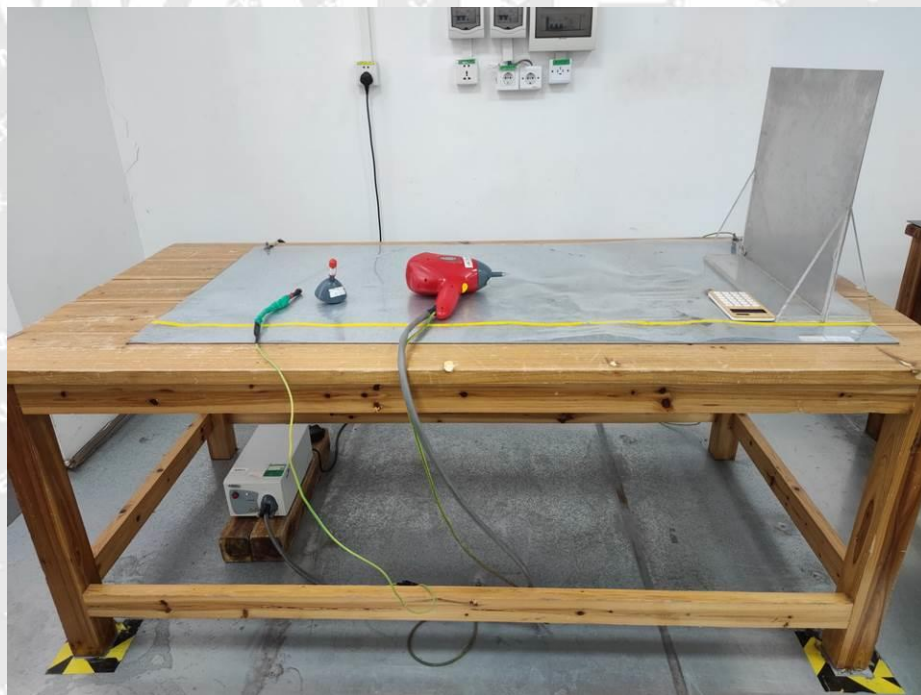


7 Photographs – Test Setup

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



7.2 Photograph – ESD Immunity Test Setup





7.3 Photograph – Continuous RF Electromagnetic Field Disturbances Test Setup

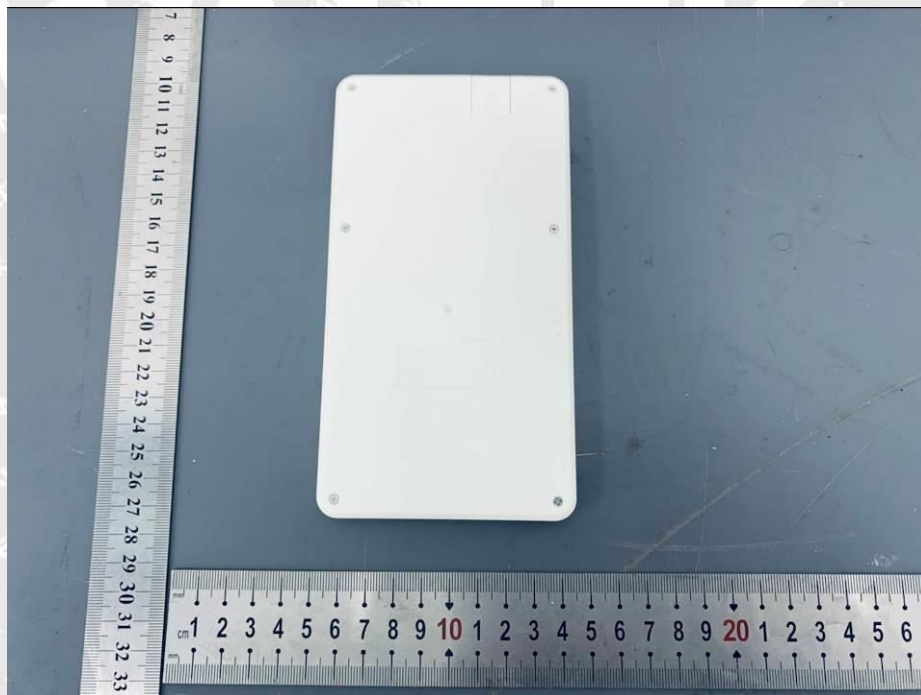
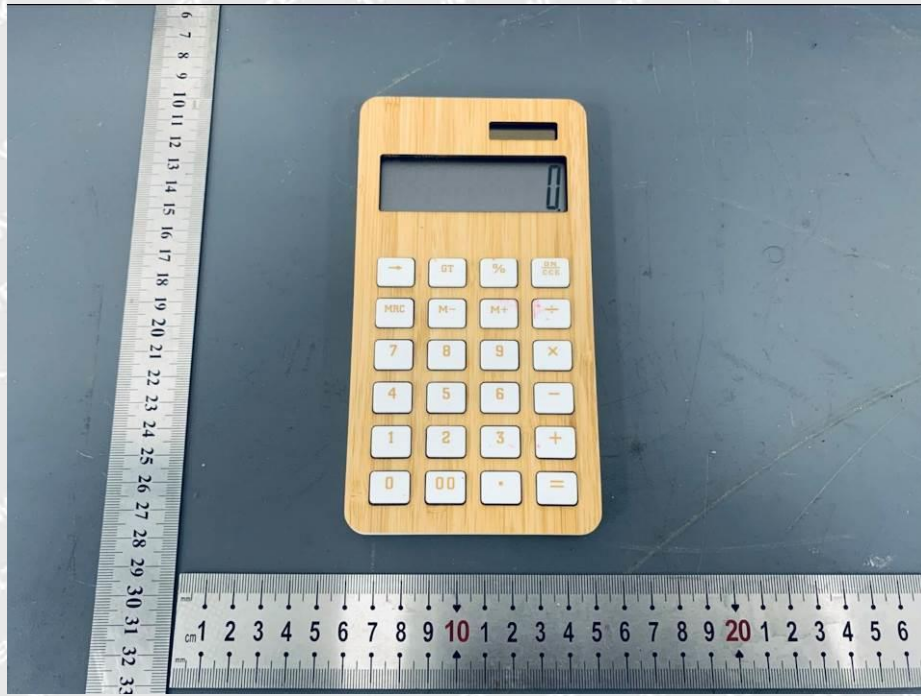


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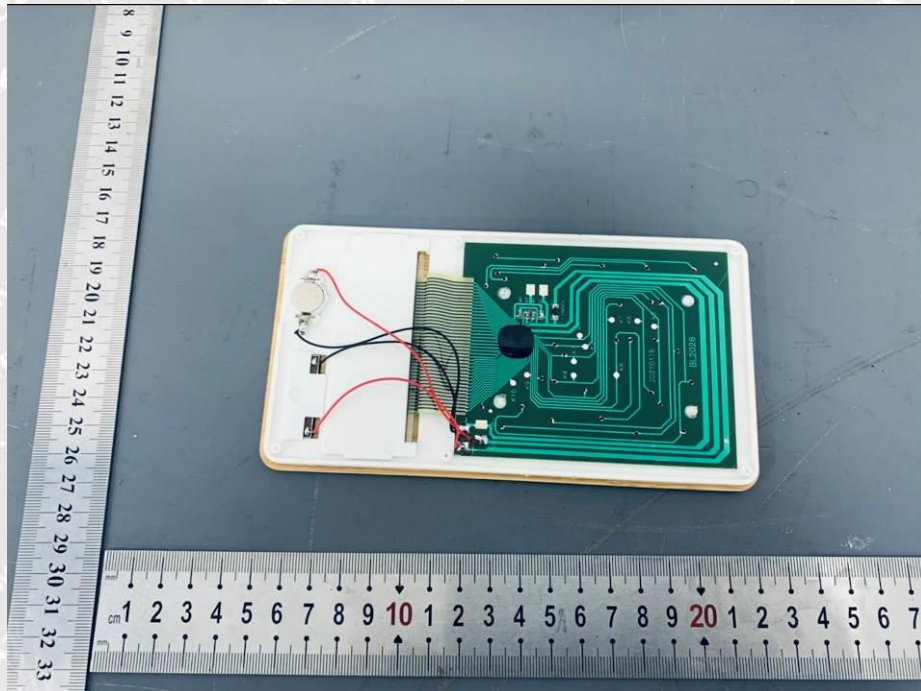
8 Photographs – Constructional Details

8.1 EUT – External View





8.2 EUT – Internal View



==== End of Report ====

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