中国认可
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检测
TESTING
CNAS L6478

TEST REPORT

Report No.	:	WTF25F07186163A1R1C
Job No.	:	FSW2507150762CJ
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	:	115375
Sample Name	:	NFC Key chains
Sample Model	:	MK5001, MK5002, MK5003, MK5004, MK5005, MK5006, MK5007, MK5008, MK5009
Test Requested	:	With reference to EU RoHS Directive 2011/65/EU and its amendment Directive EU 2015/863, to determine the Pb, Cd, Hg, Cr^{6+}, PBBs, PBDEs, DBP, BBP, DEHP, DIBP content in the submitted sample.
Test Method	:	Refer to next page (s)
Test Conclusion	:	**Pass**
Date of Receipt Sample	:	2025-07-15 & 2025-07-25 & 2025-07-30 & 2025-12-09
Testing Period	:	2025-07-15 to 2025-07-26 & 2025-07-30 to 2025-08-01 & 2025-12-09 to 2025-12-15
Date of Issue	:	2025-12-16
Test Result	:	Refer to next page (s)

Prepared By:
Waltek Testing Group (Foshan) Co., Ltd.
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Signed for and on behalf of
Waltek Testing Group (Foshan) Co., Ltd.

Swing Liang

WTF25F07186163A1R1C

Swing Liang
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Sample photo:

MK5001

MK5002

MK5003

MK5004

	
MK5005	**MK5005**
	
MK5006	**MK5006**
	
MK5007	**MK5007**

	
MK5008	**MK5008**
	
MK5009	**MK5009**

Test Results:

1. Lead, Cadmium, Mercury, Hexavalent Chromium, PBBs and PBDEs

Test Method/Equipment:

1) With reference to IEC 62321-2:2021, disassembly, disjunction and mechanical sample preparation
2) With reference to IEC 62321-3-1:2013, screening –Lead, mercury, cadmium, total chromium and total bromine by X-ray fluorescence spectrometry
3) With reference to IEC 62321-4:2013+AMD1:2017 CSV, determination of Mercury by ICP-OES
4) With reference to IEC 62321-5:2013, determination of Lead and Cadmium by ICP-OES
5) With reference to IEC 62321-7-2: 2017 and IEC 62321-7-1: 2015, determination of Hexavalent Chromium by UV-Vis
6) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS

Part No.	Part Description	Result of XRF					Result of Wet Chemical Testing (mg/kg)
		Cd	Pb	Hg	Cr	Br	
1	Silvery metal ring	BL	BL	BL	BL	--	NA
2	Silvery metal chain	BL	BL	BL	BL	--	NA
3	Silvery metal ring	BL	BL	BL	BL	--	NA
4	Transparent plastic cover	BL	BL	BL	BL	BL	NA
5	White plastic sheet with multicolour pringting	BL	BL	BL	BL	BL	NA
6(R1)	Solder	BL	IN	BL	BL	--	Pb:148
7	Black EC(whole test)	BL	BL	BL	BL	IN	PBBs: ND PBDEs: ND
8	Coppery varnished wire	BL	BL	BL	BL	BL	NA
9	Multicolour soft plastic sheet	BL	BL	BL	BL	BL	NA
10	Multicolour soft plastic sheet	BL	BL	BL	BL	BL	NA
11	White sponge	BL	BL	BL	BL	BL	NA
12	Transparent glue with multicolor plastic sheet with glue	BL	BL	BL	BL	BL	NA
13	Brown wooden with multicolour printing	BL	BL	BL	BL	BL	NA

2. Phthalates

Test Method/Equipment:

1) With reference to IEC 62321-8:2017, determination of DBP, BBP, DEHP, DIBP by GC-MS

Serial No.	Part No.	Result (mg/kg)			
		DBP	BBP	DEHP	DIBP
T01	1	--	--	--	--
T02	2	--	--	--	--
T03	3	--	--	--	--
T04	4	ND	ND	ND	ND
T05	5	ND	ND	ND	ND
T06	6(R1)	--	--	--	--
T07	7	ND	ND	ND	ND
T08	8	ND	ND	ND	ND
T09	9	ND	ND	ND	ND
T10	10	ND	ND	ND	ND
T11	11	ND	ND	ND	ND
T12	12	ND	ND	ND	ND
T13	13	ND	ND	ND	ND

Remark:

(1) Results are obtained by XRF for primary screening, and further chemical testing by ICP (for Cd, Pb, Hg), UV-VIS (for Cr^{6+}) and GC-MS (for PBBs, PBDEs) is recommended to be performed, if the concentration exceeds the below warning value according to IEC 62321-3-1: 2013 (unit: mg/kg)

Element	Polymer	Metal	Composite Materials
Cd	BL ≤ (70-3σ) < IN < (130+3σ) ≤ OL	BL ≤ (70-3σ) < IN < (130+3σ) ≤ OL	LOD < IN < (150+3σ) ≤ OL
Pb	BL ≤ (700-3σ) < IN < (1300+3σ) ≤ OL	BL ≤ (700-3σ) < IN < (1300+3σ) ≤ OL	BL ≤ (500-3σ) < IN < (1500+3σ) ≤ OL
Hg	BL ≤ (700-3σ) < IN < (1300+3σ) ≤ OL	BL ≤ (700-3σ) < IN < (1300+3σ) ≤ OL	BL ≤ (500-3σ) < IN < (1500+3σ) ≤ OL
Cr	BL ≤ (700-3σ) < IN	BL ≤ (700-3σ) <IN	BL ≤ (500-3σ) < IN
Br	BL ≤ (300-3σ) < IN	--	BL ≤ (250-3σ) < IN

BL= Below Limit OL= Over Limit LOD = Limit of Detection

(2) "IN" expresses the inconclusive region, and further chemical testing to confirm whether it complies with the requirement of RoHS Directive.

(3) The XRF screening test for RoHS elements – the reading may be different to the actual content in the sample be of non-uniformity composition.

(4) mg/kg =milligram per kilogram=ppm, μg/cm^2= Micrograms per square centimetre.

(5) ND = Not Detected or lower than limit of quantitation.

(6) NA = Not Applicable, as the XRF screening test result was below the limit or as the XRF screening directly determine that test result was over the limit, it was not need to conduct the wet chemical testing.

(7) -- = Not Regulated

(8) LOQ = Limit of quantitation.

Test Items	Pb	Cd	Hg	Cr^{6+}		PBB	PBDE	DBP	BBP	DEHP	DIBP
Units	mg/kg	mg/kg	mg/kg	mg/kg	$\mu g/cm^2$	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOQ	2	2	2	8	0.1	5	5	50	50	50	50

The LOQ for single compound of PBBs and PBDEs is 5mg/kg, LOQ of Cr^{6+} for polymer and composite sample is 8mg/kg and LOQ of Cr^{6+} for metal sample is 0.1μg/cm^2.

(9) According to IEC 62321-7-1:2015, determined of Cr^{6+} on metal sample by boiling water extraction test method, and result is shown as Positive/Negative.

Boiling water extraction:

Negative = Absence of Cr^{6+} coating, the detected concentration in boiling water extraction solution is less than 0.10μg/cm^2.

Positive = Presence of Cr^{6+} coating, the detected concentration in boiling water extraction solution is greater than 0.13μg/cm^2.

Information on storage conditions and production date of the tested sample is unavailable and thus Cr^{6+} results represent status of the sample at the time of testing.

(10)RoHS Requirement

Restricted Substances	Limits
Cadmium (Cd)	0.01% (100 mg/kg)
Lead (Pb)	0.1% (1000 mg/kg)
Mercury (Hg)	0.1% (1000 mg/kg)
Chromium (VI) (Cr^{6+})	0.1% (1000 mg/kg)
Polybrominated Biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000 mg/kg)
Dibutyl phthalate (DBP)	0.1% (1000 mg/kg)
Benzyl butyl phthalate (BBP)	0.1% (1000 mg/kg)
Di(2-ethylhexyl) phthalate (DEHP)	0.1% (1000 mg/kg)
Di-iso-butyl phthalate (DIBP)	0.1% (1000 mg/kg)

(11) Abbreviation:

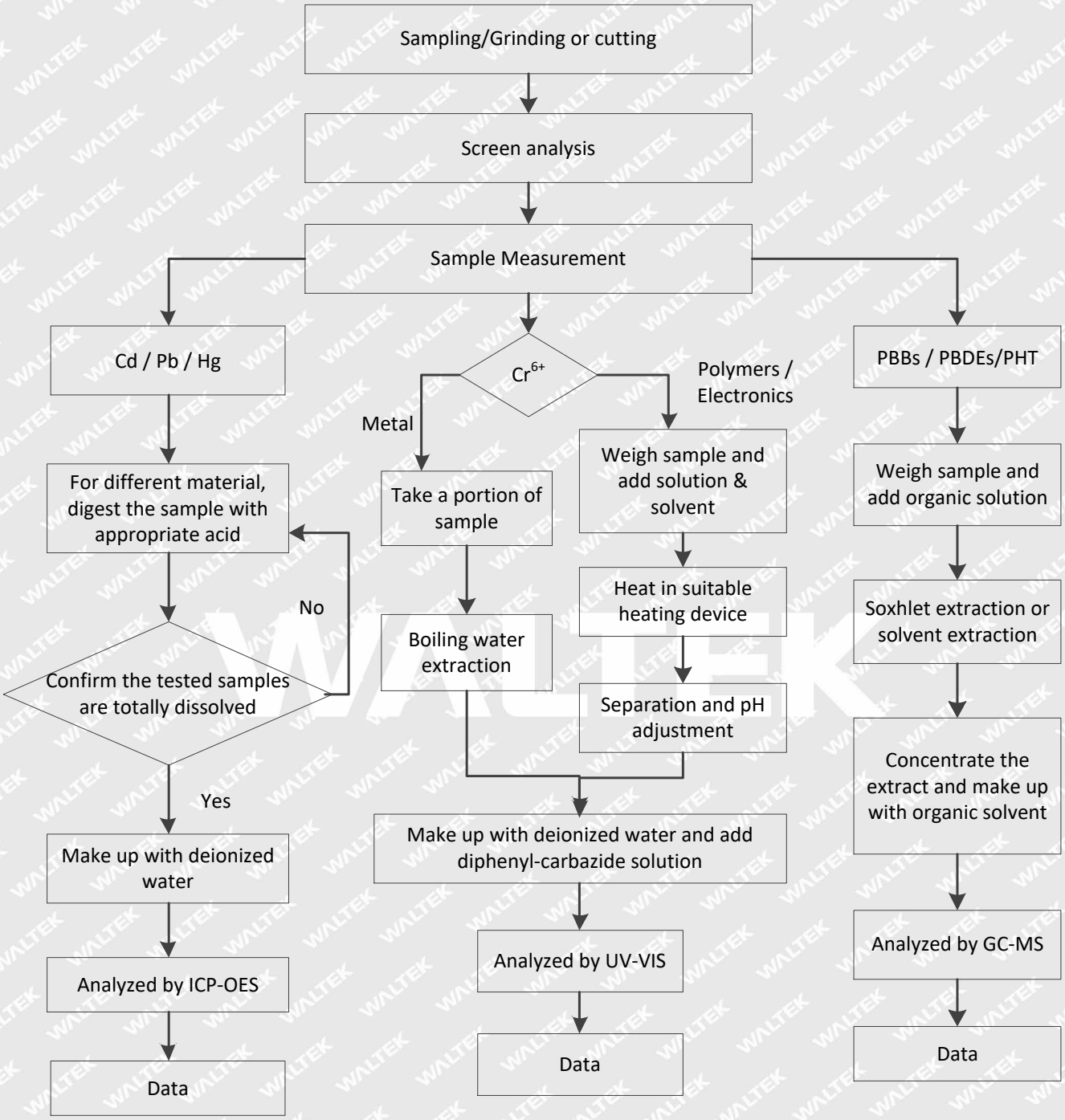
"Pb" denotes Lead, "Cd" denotes Cadmium, "Hg" denotes Mercury, "Cr" denotes Chromium, "Cr^{6+}" denotes Hexavalent Chromium, "Br" denotes Bromine, "PBBs" denotes Total Polybrominated Biphenyls, "PBDEs" denotes Total Polybrominated Diphenyl Ethers.

"DBP" denotes Dibutyl phthalate, "BBP" denotes Benzyl butyl phthalate (BBP), "DEHP" denotes Bis(2-ethylhexyl)-phthalate, "DIBP" denotes Diisobutyl phthalate, "PHT" denotes Phthalates.

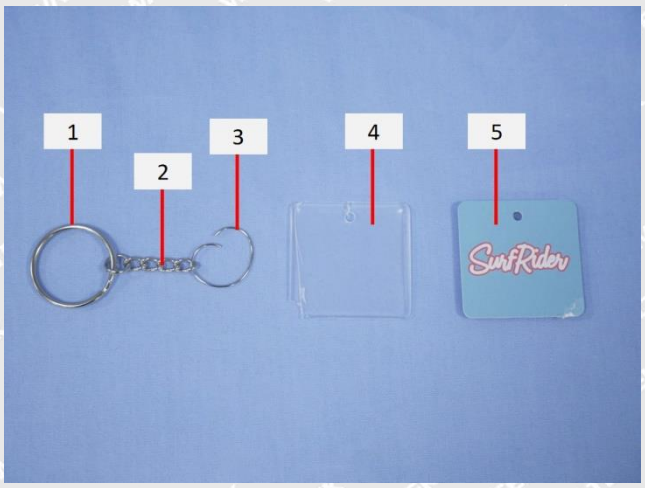
(12) As per client's requirement, to test the specified components. The test results relate only to the components tested, and it doesn't mean that the whole product complies with the RoHS Directive 2011/65/EU and its amendment (EU) No. 2015/863.

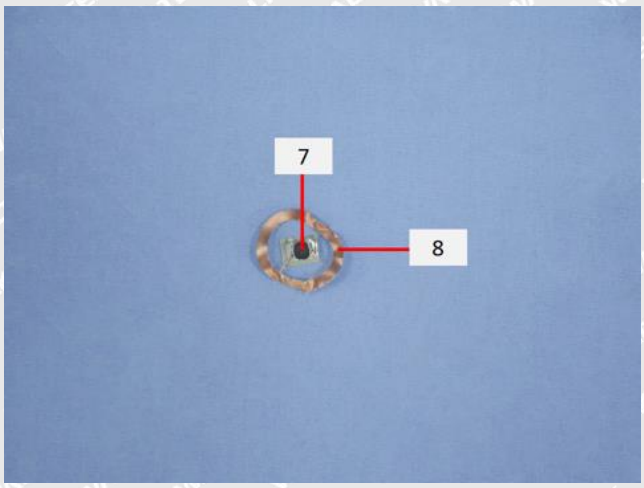
(13)As per client’s requirement, the test results of No.1 to No.8 are extracted from report No. WTF25F07186163A1C.

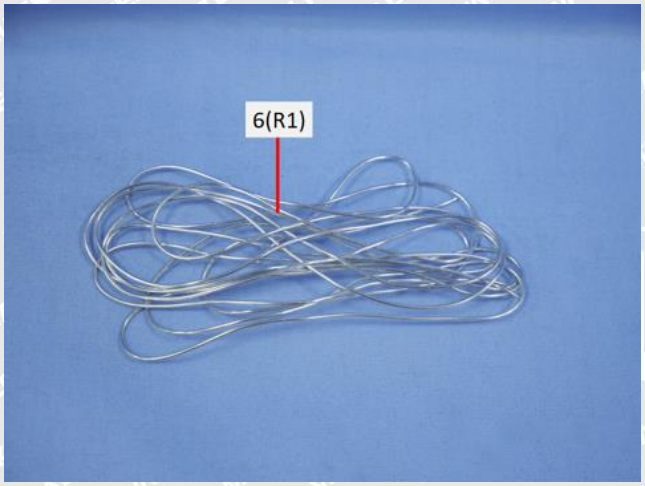
Testing Flow chart:



Photograph of parts tested:







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Remarks:

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5. If the report is not stamped with the accreditation recognized seal, it will only be used for scientific research, education, and internal quality control activities, and is not used for the purpose of issuing supporting data to the society.
6. The sample material information (Model No. information) is provided by client, not verified by test laboratory. The samples of reference Model No. are not tested. Test laboratory not responsible for the accuracy, appropriateness, completeness and authenticity of the information provided by client.

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

TEST REPORT

Report No.	:	WTF25F07186165R1C
Job No.	:	FSW2507150762CJ
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	:	115375
Sample Name	:	NFC Key chains
Sample Model	:	MK5001, MK5002, MK5003, MK5004, MK5005, MK5006, MK5007, MK5008, MK5009
Test Requested	:	Determination of specified Polycyclic Aromatic Hydrocarbons (PAHs) content in submitted sample in accordance with Entries 50 of Annex XVII of REACH Regulation (EC) No 1907/2006 and its amendment Regulation (EU) No 1272/2013.
Test Method	:	Refer to next page (s)
Test Conclusion	:	**Pass** (please refer to next pages for details)
Date of Receipt Sample	:	2025-07-15 & 2025-12-09
Testing Period	:	2025-07-15 to 2025-07-21 & 2025-12-09 to 2025-12-15
Date of Issue	:	2025-12-16
Test Result	:	Refer to next page (s)

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Signed for and on behalf of
Waltek Testing Group (Foshan) Co., Ltd.

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WTF25F07186165R1C

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Sample photo:

MK5001

MK5002

MK5003

MK5004

MK5005

MK5005

MK5006

MK5006

MK5007

MK5007

MK5008

MK5008

	
MK5009	MK5009

Test Results:

Test Method: With reference to AFPS GS 2019:01 PAK method, analysis was performed by Gas Chromatographic Mass Spectrometry (GC-MS).

Test Items	Unit	Results	LOQ	Limit
		No.4+No.5		
Benzo(a)anthracene (BaA)	mg/kg	ND*	0.2	1.0
Chrysene (CHR)	mg/kg	ND*	0.2	1.0
Benzo[b]fluoranthene (BbFA)	mg/kg	ND*	0.2	1.0
Benzo[k]fluoranthene (BkFA)	mg/kg	ND*	0.2	1.0
Benzo(a)pyrene (BaP)	mg/kg	ND*	0.2	1.0
Dibenzo[a,h]anthracene (DBAhA)	mg/kg	ND*	0.2	1.0
Benzo[j]fluoranthene (BjFA)	mg/kg	ND*	0.2	1.0
Benzo[e]Pyrene (BeP)	mg/kg	ND*	0.2	1.0
Conclusion	--	**Pass**	--	--

Test Items	Unit	Results	LOQ	Limit
		No.9+No.10+No.12		
Benzo(a)anthracene (BaA)	mg/kg	ND*	0.2	1.0
Chrysene (CHR)	mg/kg	ND*	0.2	1.0
Benzo[b]fluoranthene (BbFA)	mg/kg	ND*	0.2	1.0
Benzo[k]fluoranthene (BkFA)	mg/kg	ND*	0.2	1.0
Benzo(a)pyrene (BaP)	mg/kg	ND*	0.2	1.0
Dibenzo[a,h]anthracene (DBAhA)	mg/kg	ND*	0.2	1.0
Benzo[j]fluoranthene (BjFA)	mg/kg	ND*	0.2	1.0
Benzo[e]Pyrene (BeP)	mg/kg	ND*	0.2	1.0
Conclusion	--	**Pass**	--	--

Note:

(1) ND = Not Detected or lower than limit of quantitation

(2) mg/kg=milligram per kilogram=ppm

(3) LOQ = Limit of quantitation

(4) As per Entries 50 of Annex XVII of REACH Regulation (EC) No 1907/2006 and its amendment Regulation (EU) No 1272/2013, Articles shall not be placed on the market for supply to the general public, if any of their rubber or plastic components that come into direct as well as prolonged or short-term repetitive contact with the human skin or the oral cavity, under normal or reasonably foreseeable conditions of use, contain more than 1 mg/kg (0,0001 % by weight of this component) of any of the listed PAHs.

(5) As per Entries 50 of Annex XVII of REACH Regulation (EC) No 1907/2006 and its amendment Regulation (EU) No 1272/2013, Toys, including activity toys, and childcare articles, shall not be placed on the market, if any of their rubber or plastic components that come into direct as well as prolonged or short-term repetitive contact with the human skin or the oral cavity, under normal or reasonably foreseeable conditions of use, contain more than 0,5 mg/kg (0,00005 % by weight of this component) of any of the listed PAHs.

(6) “*” = As per applicant's requirement, the testing was conducted based on mixed components by weight in equal ratio, results are calculated by the minimum weight of mixed components.

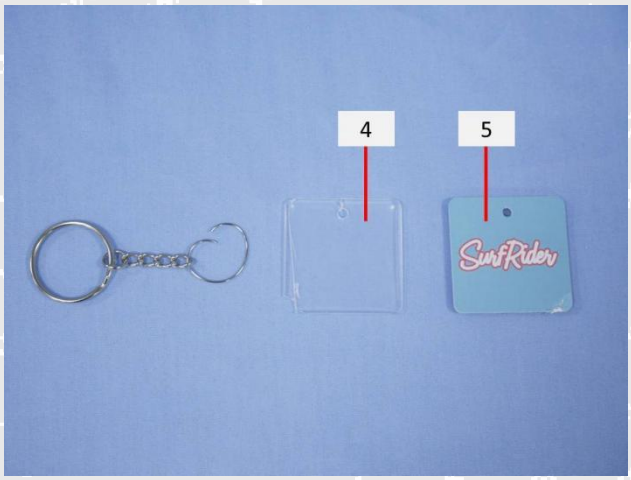
(7) As specified by client, only test the designated sample.

(8)As per client’s requirement, the test results of No.4 to No.5 are extracted from report No. WTF25F07186165C.

Description for Specimen:

Specimen ID	Specimen No.	Specimen Description
FSW2507150762CJ. 4	4	Transparent plastic cover
FSW2507150762CJ. 5	5	White plastic sheet with multicolour pringting
FSW2507150762CJ. 9	9	Multicolour soft plastic sheet
FSW2507150762CJ. 10	10	Multicolour soft plastic sheet
FSW2507150762CJ. 12	12	Transparent glue with multicolor plastic sheet with glue

Photograph of parts tested:



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Remarks:

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6. The sample material information (Model No. information) is provided by client, not verified by test laboratory. The samples of reference Model No. are not tested. Test laboratory not responsible for the accuracy, appropriateness, completeness and authenticity of the information provided by client.

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

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TEST REPORT

Reference No.	:	WTF25F12328866E
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	:	115375
Address	:	---
Product Name	:	NFC keyring
Model No.	:	MK5001, MK5002, MK5003, MK5004, MK5005, MK5006, MK5007, MK5008, MK5009
Test specification	:	EN IEC 55014-1:2021 EN IEC 55014-2:2021
Date of Receipt sample	:	---
Date of Test	:	Refer to section 3.8
Date of Issue	:	2025-12-19
Test Report Form No.	:	WEH-55014A-03C
Test Result	:	**Pass**

Remarks:
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Prepared By:
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Tested by: Leo Feng

Leo Feng

Approved by: Danny zhou

Danny Zhou

1 Test Summary

EMISSION			
Test Item	**Test Standard**	**Class / Severity**	**Result**
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	EN IEC 55014-1:2021	Clause 4.3.3.6	N/A
Disturbance Power, 30MHz to 300MHz	EN IEC 55014-1:2021	Clause 4.3.4.4	N/A
Discontinuous Disturbance (Click)	EN IEC 55014-1:2021	Clause 4.4.2	N/A**
Radiated Disturbance, 30MHz to 1000MHz	EN IEC 55014-1:2021	Clause 4.3.4.5	Pass

IMMUNITY (EN IEC 55014-2:2021)				
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
Radio-Frequency Electromagnetic Fields (80MHz to 1GHz)	IEC 61000-4-3:2006+A1:2007+A2:2010	3V/m, 80%, 1kHz, Amp. Mod.	A	Pass
Electrical Fast Transients (EFT)	IEC 61000-4-4:2012	AC ±1.0kV DC ±0.5kV	B	N/A
Surge	IEC 61000-4-5:2014+A1:2017	±1kV D.M.† ±2kV C.M.‡	B	N/A
Injected Currents, 0.15MHz to 230MHz	IEC 61000-4-6:2013	3Vr.m.s.(emf), 80%, 1kHz Amp. Mod.	A	N/A
Voltage Dips and Interruptions	IEC 61000-4-11:2020	0 % UT * for 0.5per	C	N/A
		40 % UT * for 10per		N/A
		70 % UT * for 25per		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
*	UT is the nominal supply voltage
**	According to the electrical characteristics and usage of the equipment, the EUT does not produce discontinuous radio interference voltages on AC Mains. Therefore this test item has been skipped.

2 Contents

3 General Information

3.1 General Description of E.U.T.

Product Name	:	NFC keyring
Model No.	:	MK5001, MK5002, MK5003, MK5004, MK5005, MK5006, MK5007, MK5008, MK5009
Remark	:	All models have same circuit diagram except for different appearance. Therefore the full EMC tests were performed on model MK5001.

3.2 Details of E.U.T.

Technical Data	:	DC 1.5V

3.3 Description of Support Units

The EUT has been tested as an independent unit. MK5001 is the test sample. The RE, ESD & RS tests were performed in the condition of DC 1.5V input.

3.4 Standards Applicable for Testing

The tests were performed according to following standards:

EN IEC 55014-1:2021	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
EN IEC 55014-2:2021	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity Product Family Standard

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 an 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.

3.8 Other

This report is based on Project No. WTF25F07186166E for adding new models: MK5005, MK5006, MK5007, MK5008, MK5009. The new models have same circuit diagram with original models except for different appearance. The above updated information do not affect the EMC test items and no further test has been performed.

4 Equipment Used during Test

☐Radiated Disturbance (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
☐Radiated Disturbance (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
☐ESD					
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Status**
1.	ESD Simulator	TESEQ	NSG437	521	Valid
☐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 (Radiated Disturbance 1#)	FARATRONIC	EZ-EMC	RA-03A1-2
EMI Test Software (Radiated Disturbance 2#)	FARATRONIC	EZ-EMC	RA-03A1-2
Radiated Immunity Test Software	Chinese EMC	EMS	V1.0.0.0

4.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiated Disturbance	30MHz~1GHz	±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.
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 is any measured disturbance level exceeds the disturbance limt.

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.

5 Emission Test Results

5.1 Radiated Disturbance, 30MHz to 1GHz

Test Requirement ..... : EN IEC 55014-1 Clause 4.3.4.5

Test Method ..... : EN IEC 55014-1 Clause 5.3.4

Test Result ..... : Pass

Frequency Range ..... : 30MHz to 1GHz

Class/Severity ..... : Table 9 of EN IEC 55014-1

5.1.1 E.U.T. Operation

Operating Environment:

Temperature..... : 22.4°C

Humidity ..... : 52.6%RH

Atmospheric Pressure..... : 101.1kPa

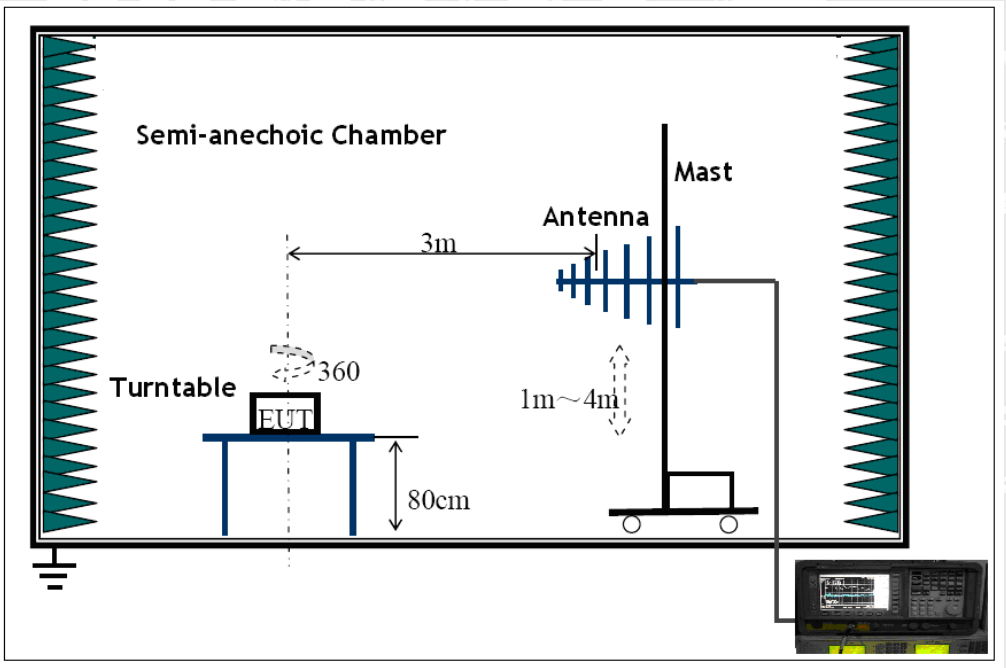
EUT Operation:

Input Voltage..... : DC 1.5V

Operating Mode ..... : Working mode

5.1.2 Block Diagram of Test Setup

The Radiated Disturbance test was performed in the 3m Semi- Anechoic Chamber test site and accordance with CISPR16-2-3.



5.1.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for Horizontal & Vertical polarisation. 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:

Corr. Ampl. = Indicated Reading + Corr. Factor

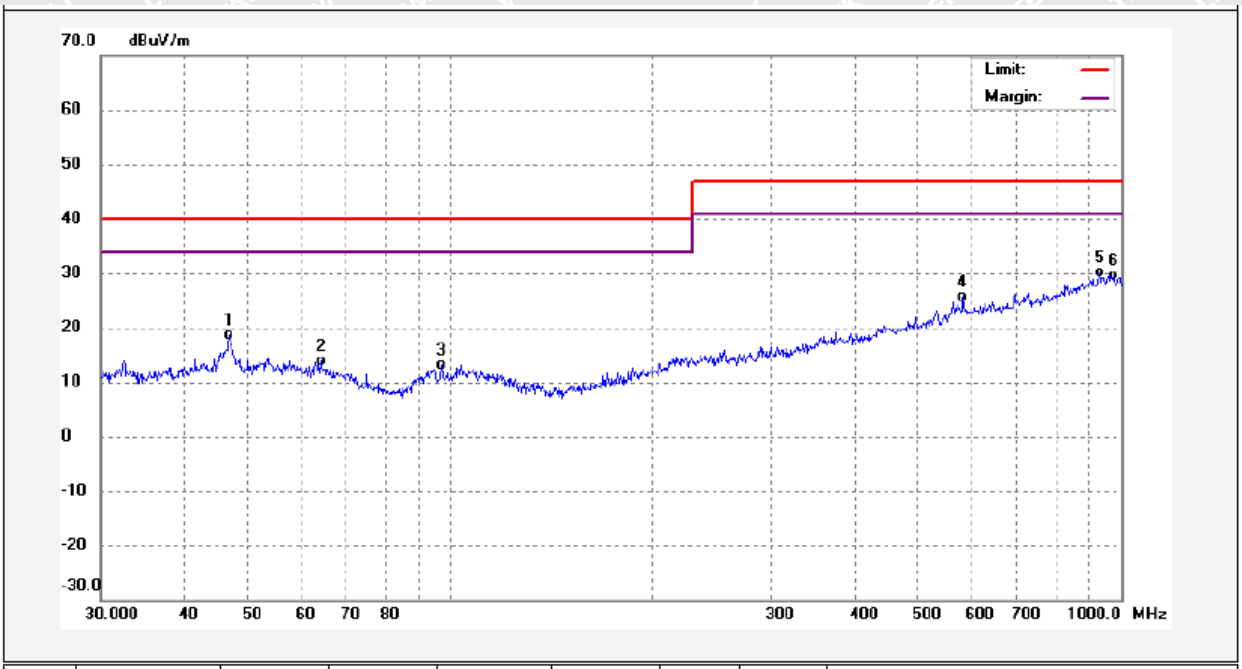
Corr. Factor=Antenna Factor + Cable Factor - Amplifier Gain

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:

Margin = Corr. Ampl. – Limit

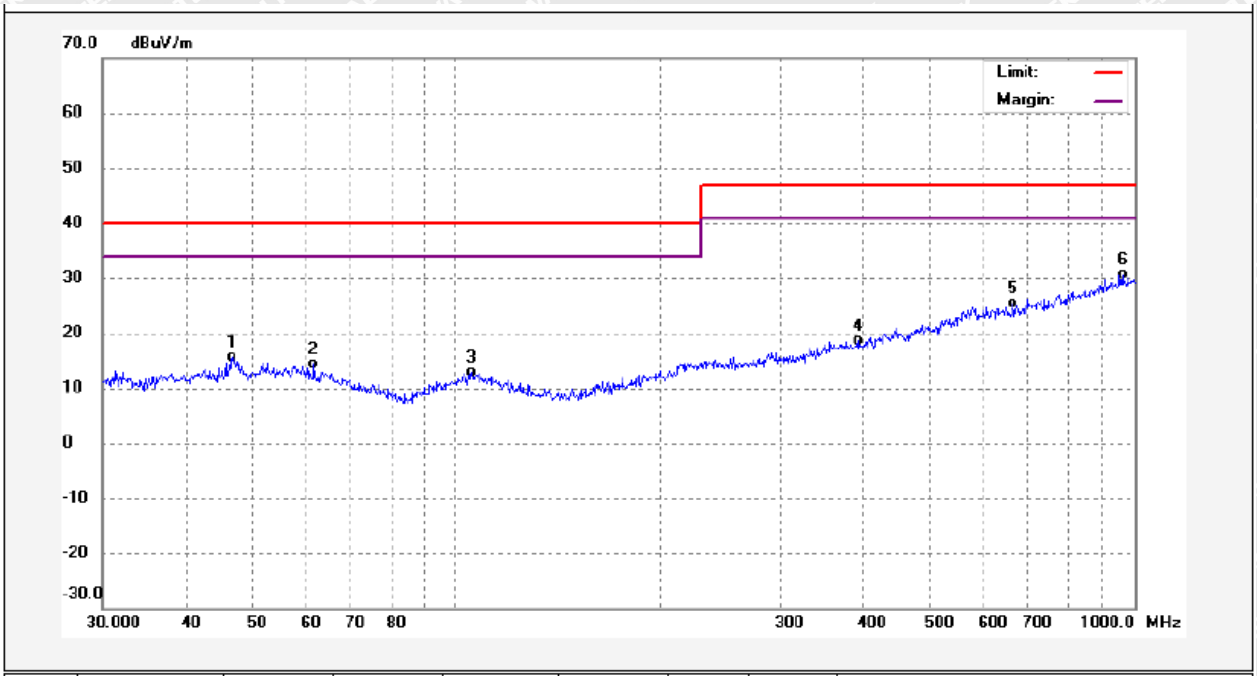
5.1.5 Radiated Disturbance Test Data

Vertical Polarization:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	46.7647	4.40	14.17	18.57	40.00	-21.43	QP	
2	64.1625	0.36	13.41	13.77	40.00	-26.23	QP	
3	96.8428	1.38	11.81	13.19	40.00	-26.81	QP	
4	582.3338	3.00	22.71	25.71	47.00	-21.29	QP	
5	931.2913	2.56	27.48	30.04	47.00	-16.96	QP	
6	977.4652	1.92	27.64	29.56	47.00	-17.44	QP	

Horizontal Polarization:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	46.7811	1.50	14.18	15.68	40.00	-24.32	QP	
2	61.6915	0.66	13.68	14.34	40.00	-25.66	QP	
3	105.3456	-0.21	13.07	12.86	40.00	-27.14	QP	
4	392.0951	0.79	17.96	18.75	47.00	-28.25	QP	
5	661.6143	2.42	22.92	25.34	47.00	-21.66	QP	
6	960.4768	3.00	27.65	30.65	47.00	-16.35	QP	

6 Immunity Test Results

6.1 Performance Criteria

Performance criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however, no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self- recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

For further details, please refer to EN IEC 55014-2.

6.2 Electrostatic Discharge (ESD)

Test Requirement ..... : EN IEC 55014-2 Clause 5.1

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 ..... : 21.3°C

Humidity ..... : 51.9%RH

Barometric Pressure ..... : 101.7kPa

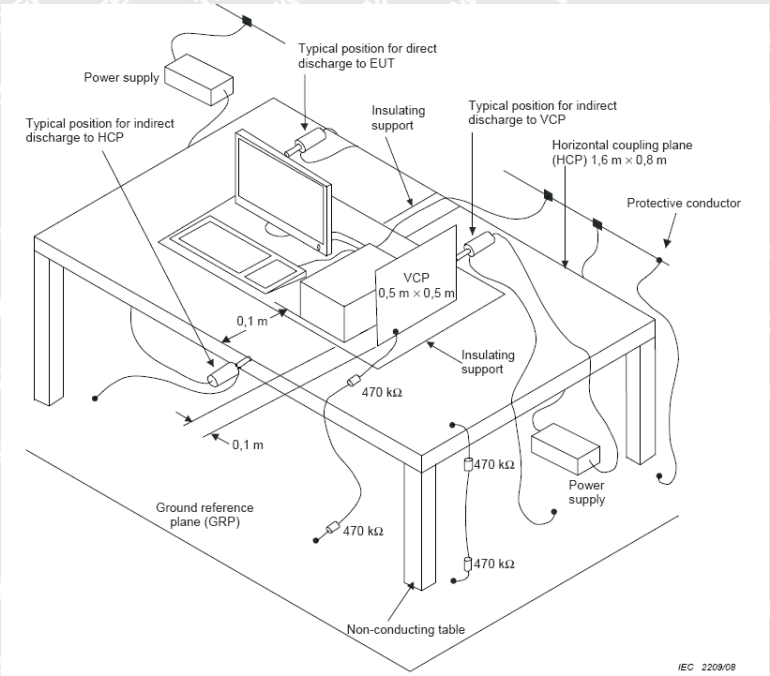
EUT Operation:

Input Voltage ..... : DC 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.



6.2.3Direct 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 Radio-Frequency Electromagnetic Fields, 80MHz to 1GHz

Test Requirement ..... : EN IEC 55014-2 Clause 5.5

Test Method ..... : IEC 61000-4-3

Test Result ..... : Pass

Frequency Range ..... : 80MHz to 1GHz

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 ..... : 51.5% RH

Barometric Pressure ..... : 101.4kPa

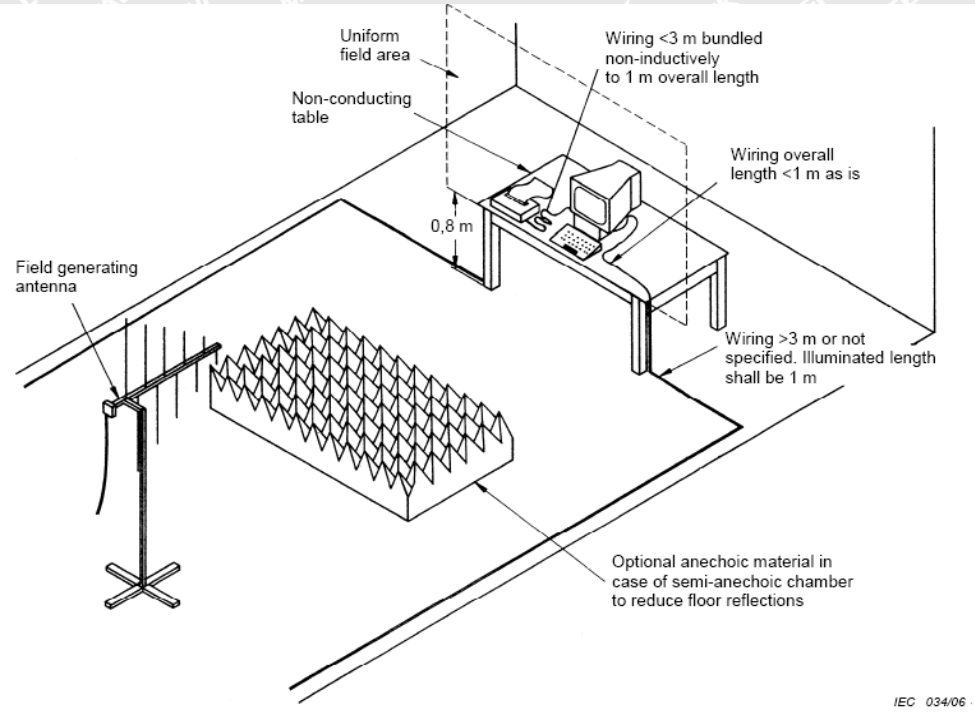
EUT Operation:

Input Voltage ..... : DC 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.



6.3.3Test Results

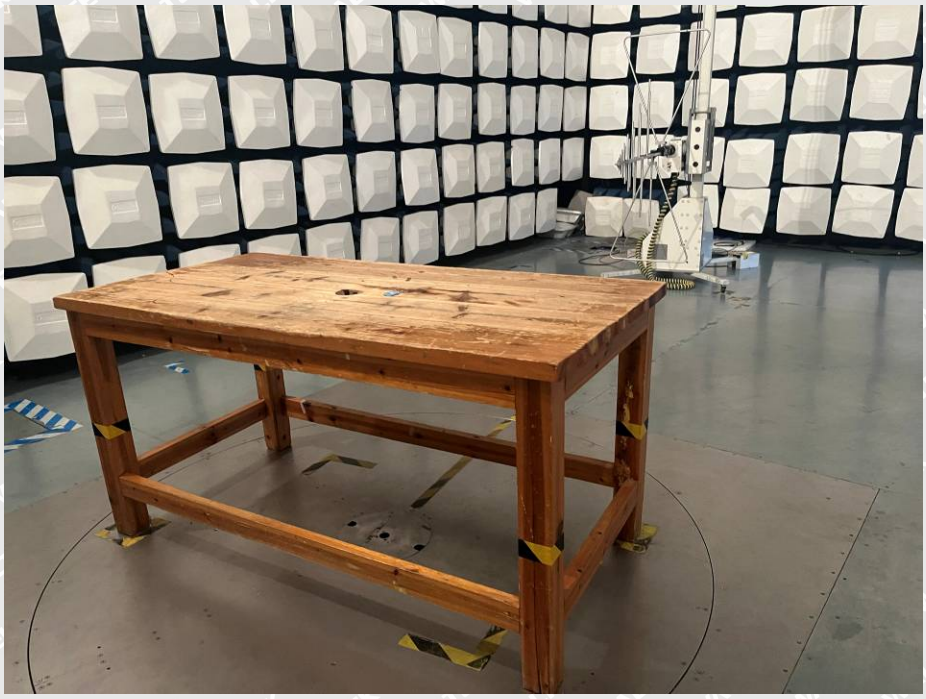
Frequency	Face of EUT	Antenna polarisation	Test Level	Step Size	Dwell Time	Performance Criterion	Result
80 to 1000MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass*
80 to 1000MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass*

Remark:

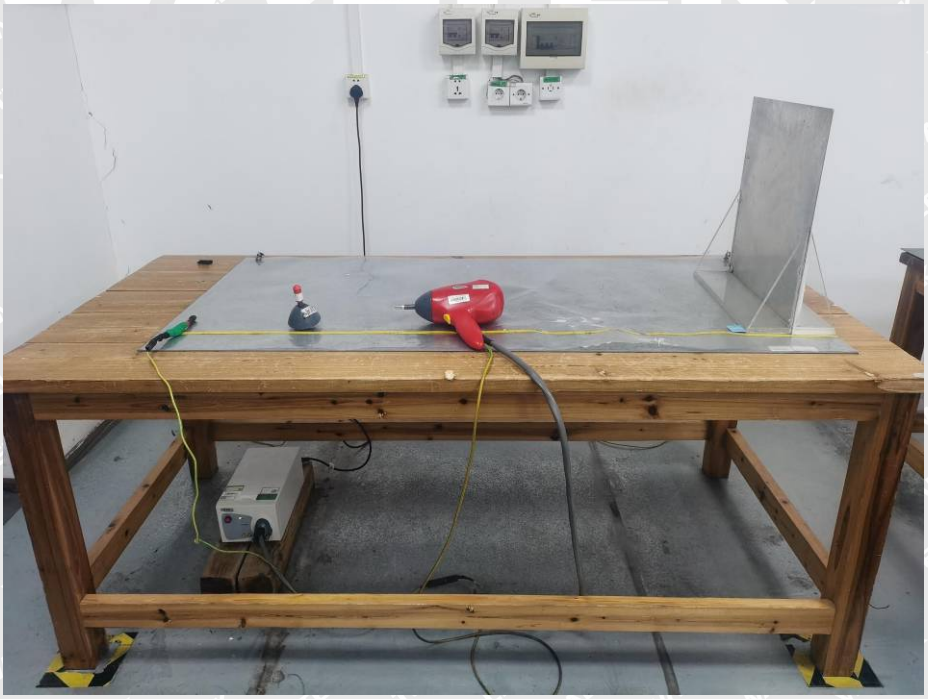
* During the test no deviation was detected to the selected operation mode(s)

7 Photographs – Test Setup

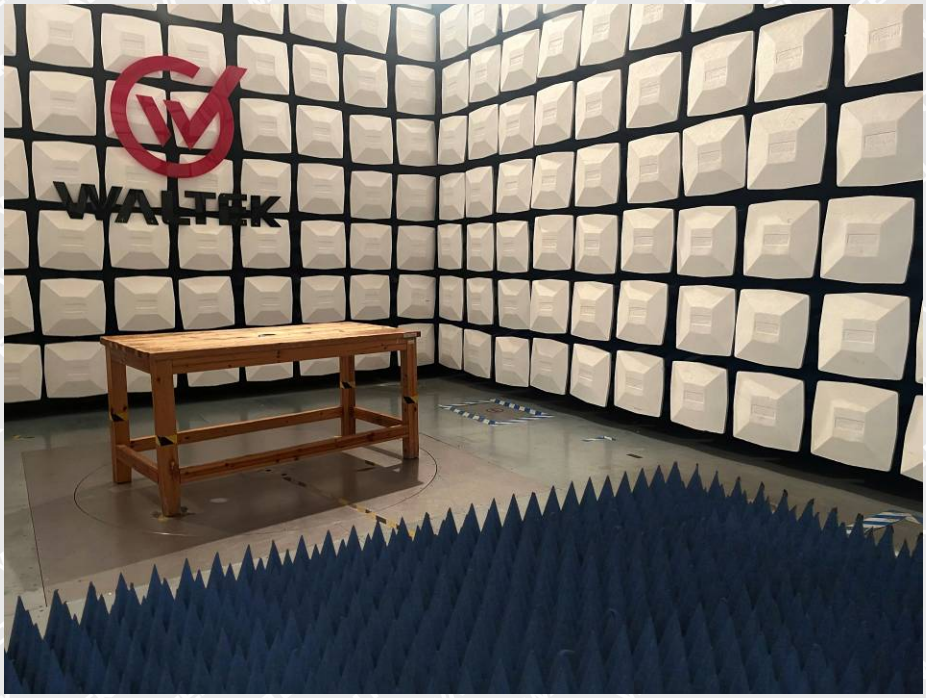
7.1 Photograph – Radiated Disturbance Test Setup



7.2 Photograph – ESD Immunity Test Setup



7.3 Photograph – Radio-Frequency Electromagnetic Fields Immunity Test Setup



8 Photographs – Constructional Details

8.1 EUT – External View

Model MK5001

Model MK5002

Model MK5003

Model MK5004

Model MK5005

Model MK5006

Model MK5007

Model MK5007

Model MK5008

Model MK5009

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