

EMC TEST REPORT

For CE-EMC

Report No. : SSP24060019-1E

Applicant : Ropla Elektronik Sp. z o. o.

Product Name : LITHIUM BATTERY

Model Name : LIR3048

Test Standard : EN 55032 :2015+A1 :2020
EN 55035 :2017+A11 :2020

Date of Issue : 2024-06-06



Shenzhen CCUT Quality Technology Co., Ltd.

1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen,
Guangdong, China; (Tel.:+86-755-23406590 website: www.ccuttest.com)

This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen CCUT Quality Technology Co., Ltd.

Test Report Basic Information

Applicant:	Ropla Elektronik Sp. z o. o.
Address of Applicant:	Wrocławska 1C, 55-200 Suchy Dwór
Manufacturer:	Ropla Elektronik Sp. z o. o.
Address of Manufacturer:	Wrocławska 1C, 55-200 Suchy Dwór
Product Name:	LITHIUM BATTERY
Brand Name:	Akyga battery
Main Model:	LIR3048
Series Models:	LIR1025, LIR1040, LIR1220, LIR1254, LIR1255, LIR1620, LIR1632, LIR1648, LIR1654, LIR2016, LIR2025, LIR2032, LIR2050, LIR2430, LIR2440, LIR2450, LIR2477, LIR3032.
Test Standard:	EN 55032 :2015+A1 :2020 EN 55035 :2017+A11 :2020
Date of Test	2024-06-04 to 2024-06-06
Test Result:	PASS
Tested By	<u>Choco Qiu</u> (Choco Qiu)
Reviewed By:	<u>Lieber Ouyang</u> (Lieber Ouyang)
Authorized Signatory:	<u>Lahm Peng</u> (Lahm Peng)
Note : This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen CCUT Quality Technology Co., Ltd.. All test data presented in this test report is only applicable to presented test sample.	



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Revision History

Revision	Issue Date	Description	Revised By
V1.0	2024-06-06	Initial Release	Lahm Peng

1. General Information

1.1 Product Information

Product Name:	LITHIUM BATTERY
Trade Name:	Akyga battery
Main Model:	LIR3048
Series Models:	LIR1025, LIR1040, LIR1220, LIR1254, LIR1255, LIR1620, LIR1632, LIR1648, LIR1654, LIR2016, LIR2025, LIR2032, LIR2050, LIR2430, LIR2440, LIR2450, LIR2477, LIR3032.
Class of Equipment:	☐ Class A ☒ Class B
Highest Internal Frequency:	<108MHz
Rated Voltage:	DC 3.7V, 280mAh
Note 1: The test data is gathered from a production sample, provided by the manufacturer. Note 2: The color of appearance and model name of series models listed are different from the main model, but the circuit and the electronic construction are the same, declared by the manufacturer.	

1.2 Test Setup Information

List of Test Modes			
Test Mode	Description	Remark	
TM1	Discharging	Output: 3.7V	
TM2	-	-	
TM3	-	-	
TM4	-	-	
List and Details of Auxiliary Cable			
Description	Length (cm)	Shielded/Unshielded	With/Without Ferrite
-	-	-	-
-	-	-	-
List and Details of Auxiliary Equipment			
Description	Manufacturer	Model	Serial Number
-	-	-	-
-	-	-	-
The equipment under test (EUT) was configured to measure its highest possible emission and immunity level. The test modes were adapted according to the operation manual for use.			

1.3 Compliance Standards

Compliance Standards	
EN 55032:2015+A1:2020	Electromagnetic compatibility of multimedia equipment - Emission requirements
EN 55035:2017+A11:2020	Electromagnetic compatibility of multimedia equipment - Immunity requirements
EN IEC 61000-3-2:2019/A1:2021	Electromagnetic compatibility (EMC) - Part 3-2: Limits -Limits for harmonic current emissions (equipment input current k 16 A per phase)
EN 61000-3-3:2013+A2:2021	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection
All measurements contained in this report were conducted with all above standards	
According to standards for test methodology	
EN 55032:2015+A1:2020	Electromagnetic compatibility of multimedia equipment - Emission requirements
EN 55035:2017+A11:2020	Electromagnetic compatibility of multimedia equipment - Immunity requirements
EN IEC 61000-3-2:2019/A1:2021	Electromagnetic compatibility (EMC) - Part 3-2: Limits -Limits for harmonic current emissions (equipment input current k 16 A per phase)
EN 61000-3-3:2013+A2:2021	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection
IEC 61000-4-2:2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
IEC 61000-4-3:2020	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4:2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
IEC 61000-4-5:2017	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
IEC 61000-4-6:2013	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61000-4-8:2009	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
IEC 61000-4-11:2020	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
Note 1: this test report is only applicable to presented test sample. Note 2: The test methods in this report are based on above test standard and no other test standard or non-standard methods are used. Note 3: Any modification of the product, which result is lowering the emission, should be checked to ensure compliance has been maintained; Maintenance of compliance is the responsibility of the manufacturer or applicant.	

1.4 Performance Criteria for EMS

All the test data has been collected and analyzed within this report in accordance with Immunity requires the following as specific performance criteria:	
A	The apparatus shall continue to operate as intended during and after the test. The manufacturer specifies some minimum performance level. The performance level may be specified by the manufacturer as a permissible loss of performance.
B	The apparatus shall continue to operate as intended after the test. This indicates that the EUT does not need to function at normal performance levels during the test, but must recover. Again some minimal performance is defined by the manufacture. No change in operating state or loss or data is permitted.
C	Temporary loss of function is allowed. Operation of the EUT may stop as long as it is either automatically reset or can be manually restored by operation of the controls.

1.5 Test Facilities

Laboratory Name:	Shenzhen CCUT Quality Technology Co., Ltd. 1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China
CNAS Laboratory No.:	L18863
A2LA Certificate No.:	6893.01
FCC Registration No.:	583813
ISED Registration No.:	CN0164
All measurement facilities used to collect the measurement data are located at 1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China.	

1.6 Measurement Uncertainty

Test Item	Conditions	Uncertainty
Conducted Emissions	9kHz ~ 30MHz	±1.64 dB
Radiated Emissions	30MHz ~ 1GHz	±3.32 dB
	1GHz ~ 6GHz	±3.50 dB

1.7 List of Measurement Instruments

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Conducted Emissions					
AMN	ROHDE&SCHWARZ	ENV216	101097	2023-10-21	2024-10-20
EMI Test Receiver	ROHDE&SCHWARZ	ESPI	100242	2023-07-31	2024-07-30
EMI Test Software	FARA	EZ-EMC	EMEC-3A1+	N/A	N/A
Radiated Emissions					
EMI Test Receiver	ROHDE&SCHWARZ	ESPI	100154	2023-07-31	2024-07-30
Spectrum Analyzer	KEYSIGHT	N9020A	MY48030972	2023-07-31	2024-07-30
Amplifier	SCHWARZBECK	BBV 9743B	00251	2023-07-31	2024-07-30
Amplifier	HUABO	YXL0518-2.5-45	--	2023-07-31	2024-07-30
Loop Antenna	DAZE	ZN30900C	21104	2023-08-07	2024-08-06
Broadband Antenna	SCHWARZBECK	VULB 9168	01320	2023-08-07	2024-08-06
Horn Antenna	SCHWARZBECK	BBHA 9120D	02553	2023-08-07	2024-08-06
EMI Test Software	FARA	EZ-EMC	FA-03A2 RE+	N/A	N/A
Harmonics and Flicker					
Harmonics Analyzer	EMC Partner	HARMONICS 1000	170	2023-05-17	2024-05-16
EMS Testing					
ESD Generator	Shanghai LIONCEL	ESD-202B	0220104	2023-08-07	2024-08-06
CS Generator	Shanghai LIONCEL	RIS-6091	6091-0220601	2023-07-31	2024-07-30
Surges Test System	Shanghai LIONCEL	LCG-5411	5411-0220303	2023-07-31	2024-07-30
Voltage Regulator	Shanghai LIONCEL	MVR-16	--	2023-07-31	2024-07-30
PFMF Test System	Shanghai LIONCEL	PMF-801C-C	801C-C-0220201	2023-07-31	2024-07-30
PFMF Test System	Shanghai LIONCEL	PMF-801C-T	801C-T-0220202	2023-07-31	2024-07-30
PFMF Test Coil	Shanghai LIONCEL	PMF-801C-F	801C-F-0211103	2023-07-31	2024-07-30
Signal Generator	Aglient	N5181A	MY46240904	2023-07-31	2024-07-30
Amplifier 80M-1GHz	SKET	HAP_80M01G-250W	N/A	2023-07-31	2024-07-30
Amplifier 1GHz-3GHz	SKET	HAP_01G03G-75W	N/A	2023-07-31	2024-07-30
Amplifier 3GHz-6GHz	SKET	HAP_03G06G-75W	N/A	2023-07-31	2024-07-30
Forward Power Meter	R&S	NRP-Z11	138.3004.02-11610	2023-07-31	2024-07-30
Reverse Power Meter	R&S	NRP-Z11	138.3004.02-11694	2023-07-31	2024-07-30
Log-periodic Antenna	SKET	STLP 9129 Plus	N/A	2023-07-31	2024-07-30
EMS Software	SKET	EZ-EMC	EEMC-3A1	N/A	N/A

2. Summary of Test Results

Standards	Description of Test Items	Result
EN 55032:2015+A1:2020	Conducted Emissions	N/A
	Radiated Emissions	Passed
EN IEC 61000-3-2:2019+A1:2021	Harmonic Current Emission	N/A
EN 61000-3-3:2013+A2:2021	Voltage Fluctuation and Flicker	N/A
EN 55035:2017+A11:2020	Electrostatic Discharge Immunity	Passed
	Continuous Radiated Disturbances Immunity	Passed
	Electrical Fast Transient Immunity	N/A
	Surges Immunity	N/A
	Continuous Conducted Disturbances Immunity	N/A
	Power Frequency Magnetic Fields Immunity	Passed
	Voltage Dips and Interruptions Immunity	N/A
Passed: The EUT complies with the essential requirements in the standard Failed: The EUT does not comply with the essential requirements in the standard N/A: Not applicable		

3. Conducted Emissions

3.1 Standard and Limit

According to the standard EN 55032, table A.9 and A.10, Limits for conducted emissions for AC mains power port as below:

Table A.9 – Requirements for conducted emissions from the AC mains power ports of Class A equipment

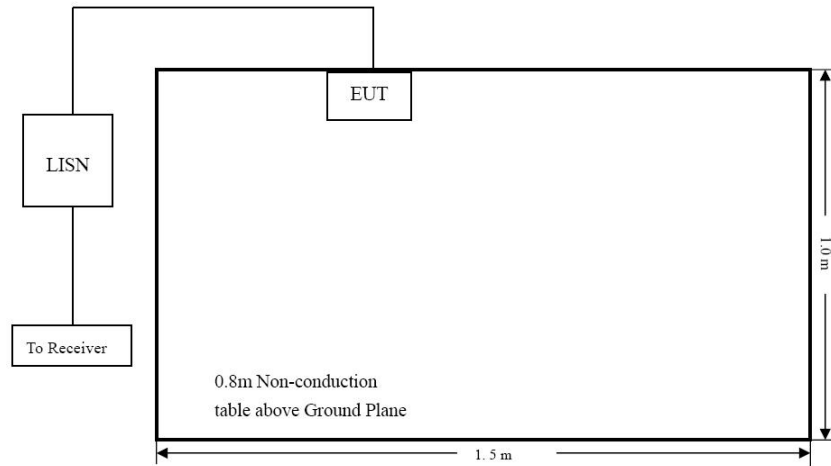
Applicable to				
1. AC mains power ports (3.1.1)				
Table clause	Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class A limits dB(μV)
A9.1	0,15 to 0,5	AMN	Quasi Peak / 9 kHz	79
	0,5 to 30			73
A9.2	0,15 to 0,5	AMN	Average / 9 kHz	66
	0,5 to 30			60
Apply A9.1 and A9.2 across the entire frequency range.				

Table A.10 – Requirements for conducted emissions from the AC mains power ports of Class B equipment

Applicable to				
1. AC mains power ports (3.1.1)				
Table clause	Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class B limits dB(μV)
A10.1	0,15 to 0,5	AMN	Quasi Peak / 9 kHz	66 to 56
	0,5 to 5			56
	5 to 30			60
A10.2	0,15 to 0,5	AMN	Average / 9 kHz	56 to 46
	0,5 to 5			46
	5 to 30			50
Apply A10.1 and A10.2 across the entire frequency range.				

3.2 Test Procedure

Test is conducting under the description of EN55032, conducted emissions of annex C and annex D.



Test Setup Block Diagram

3.3 Test Data and Results

Not applicable

4. Radiated Disturbance

4.1 Standard and Limit

According to the standard EN 55032, table A.2, A.3, A.4, A.5, A.6, limit for radiated emissions as below:

Table A.2 – Requirements for radiated emissions at frequencies up to 1 GHz for class A equipment

Table clause	Frequency range	Measurement			Class A limits dB(μV/m)
	MHz	Facility (see Table A.1)	Distance m	Detector type / bandwidth	
A2.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	40
	230 to 1 000				47
A2.2	30 to 230	OATS/SAC	3		50
	230 to 1 000				57
A2.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	42 to 35
	230 to 1 000				42
A2.4	30 to 230	FAR	3		52 to 45
	230 to 1 000				52
Apply only A2.1 or A2.2 or A2.3 or A2.4 across the entire frequency range.					

Table A.3 – Requirements for radiated emissions at frequencies above 1 GHz for class A equipment

Table clause	Frequency range MHz	Measurement			Class A limits dB(μV/m)
		Facility (see Table A.1)	Distance m	Detector type / bandwidth	
A3.1	1 000 to 3 000	FSOATS	3	Average / 1 MHz	56
	3 000 to 6 000				60
A3.2	1 000 to 3 000			Peak / 1 MHz	76
	3 000 to 6 000				80

Apply A3.1 and A3.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.

Table A.4 – Requirements for radiated emissions at frequencies up to 1 GHz for class B equipment

Table clause	Frequency range MHz	Measurement			Class B limits dB(μV/m)
		Facility (see Table A.1)	Distance m	Detector type / bandwidth	
A4.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	30
	230 to 1 000				37
A4.2	30 to 230	OATS/SAC	3		40
	230 to 1 000				47
A4.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	32 to 25
	230 to 1 000				32
A4.4	30 to 230	FAR	3		42 to 35
	230 to 1 000				42

Apply only table clause A4.1 or A4.2 or A4.3 or A4.4 across the entire frequency range.

These requirements are not applicable to the local oscillator and harmonics frequencies of equipment covered by Table A.6.

Table A.5 – Requirements for radiated emissions at frequencies above 1 GHz for class B equipment

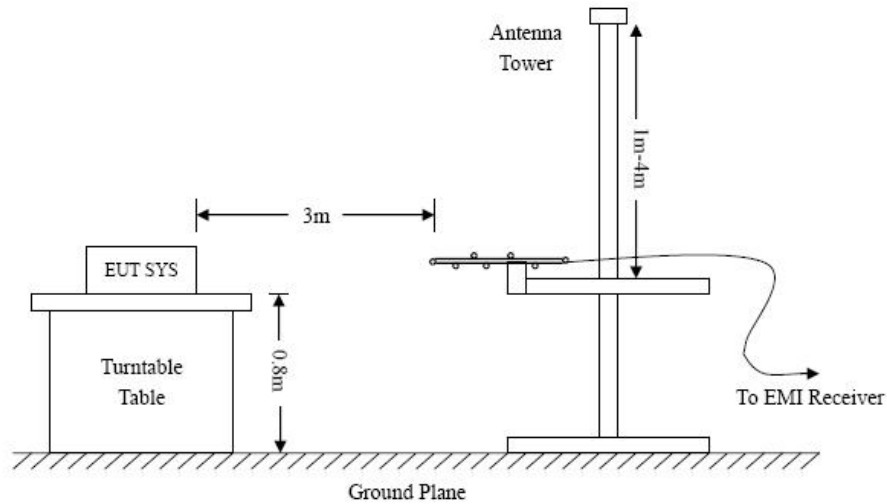
Table clause	Frequency range MHz	Measurement			Class B limits dB(μV/m)
		Facility (see Table A.1)	Distance m	Detector type/ bandwidth	
A5.1	1 000 to 3 000	FSOATS	3	Average/ 1 MHz	50
	3 000 to 6 000				54
A5.2	1 000 to 3 000			Peak/ 1 MHz	70
	3 000 to 6 000				74
Apply A5.1 and A5.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.					

Table A.6 – Requirements for radiated emissions from FM receivers

Table Clause	Frequency Range MHz	Measurement			Class B Limit dB(μV/m)	
		Facility (see Table A.1)	Distance m	Detector type / Bandwidth	Fundamental	Harmonics
A6.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	50	42
	230 to 300					42
	300 to 1 000					46
A6.2	30 to 230	OATS/SAC	3		60	52
	230 to 300					52
	300 to 1 000					56
A6.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	52 to 45	44 to 37
	230 to 300				45	37
	300 to 1 000				45	41
A6.4	30 to 230	FAR	3		62 to 55	54 to 47
	230 to 300				55	47
	300 to 1 000				55	51
Apply only A6.1 or A6.2 or A6.3 or A6.4 across the entire frequency range.						
These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits given in Table A.4.						

4.2 Test Procedure

Test is conducting under the description of EN 55032, radiation emission of annex C and annex D.



Test Setup Block Diagram

4.3 Test Data and Results

Based on all tested data, the EUT complied with the EN 55032 standard limit for a Class B device, and with the worst case as below:

Remark: Level = Reading + Factor, Margin = Level - Limit

Test Plots and Data of Radiated Emissions

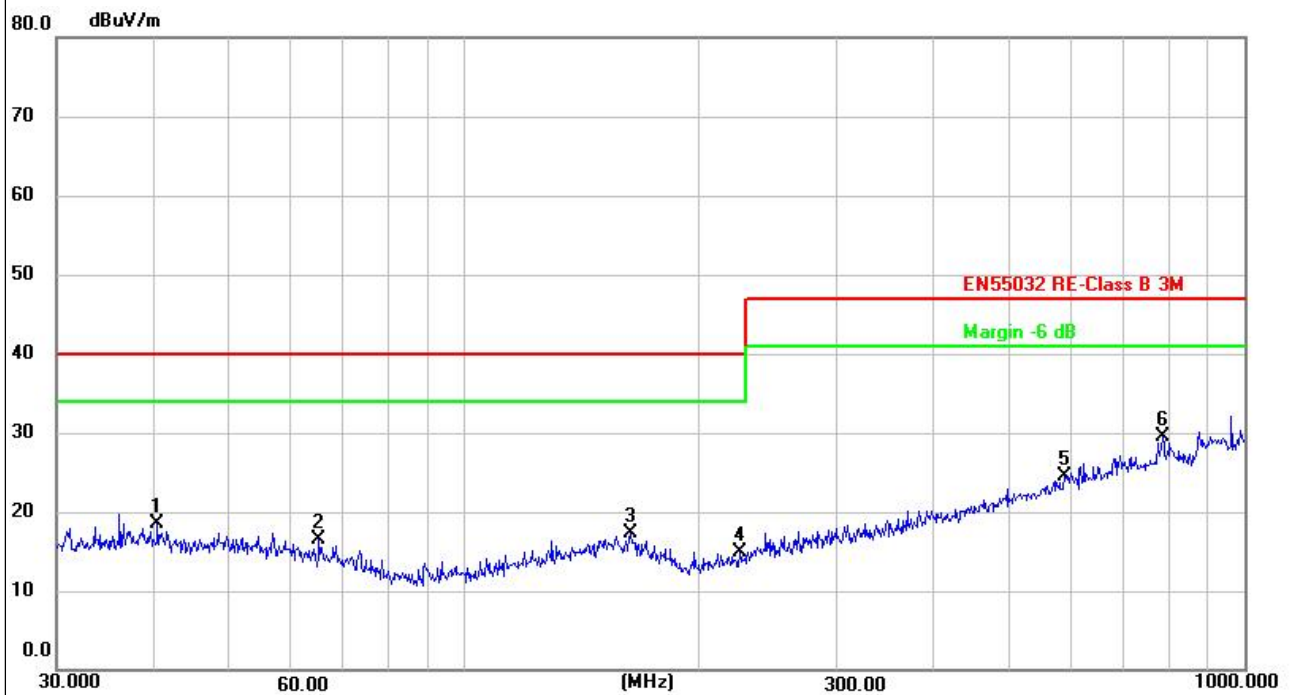
Tested Model: LIR3048

Test Mode: TM1

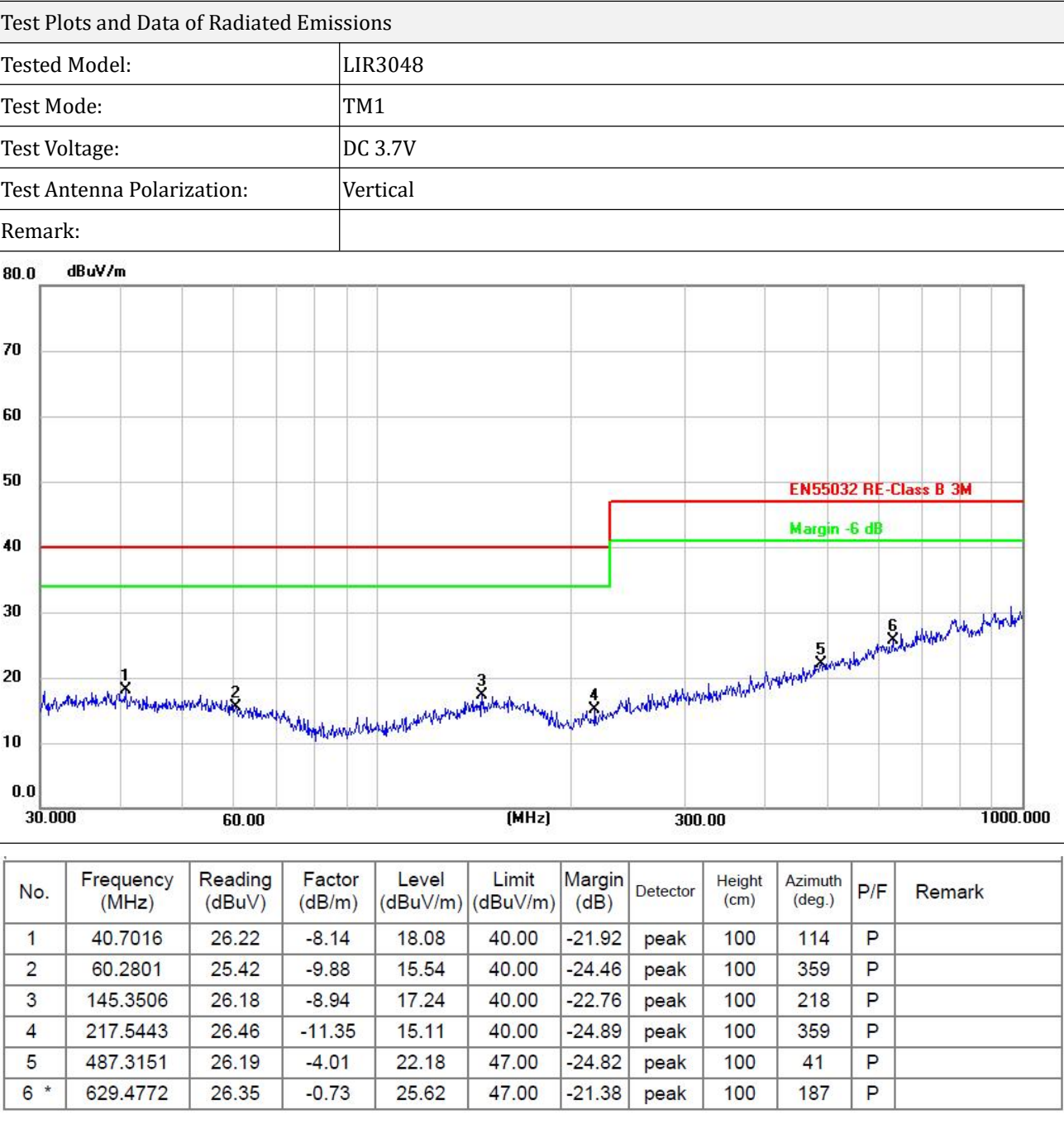
Test Voltage: DC 3.7V

Test Antenna Polarization: Horizontal

Remark:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	40.4172	26.57	-8.06	18.51	40.00	-21.49	peak	100	328	P	
2	65.1145	26.81	-10.39	16.42	40.00	-23.58	peak	100	236	P	
3	163.1818	26.47	-9.17	17.30	40.00	-22.70	peak	100	318	P	
4	225.3080	25.89	-10.90	14.99	40.00	-25.01	peak	100	216	P	
5	586.8437	26.03	-1.52	24.51	47.00	-22.49	peak	100	349	P	
6 *	785.0935	27.55	1.89	29.44	47.00	-17.56	peak	100	5	P	



5. Harmonic Current Emissions

5.1 Standard and Limit

According to the standard EN IEC 61000-3-2 Clause 7.1, limits for class B equipment.

5.2 Test Procedure

Test is conducting under the description of EN IEC 61000-3-2.

5.3 Test Data and Results

Not applicable

6. Voltage Fluctuation and Flicker

6.1 Standard and Limit

According to the standard EN 61000-3-3 Clause 5.

6.2 Test Procedure

Test is conducting under the description of EN 61000-3-3.

6.3 Test Data and Results

Not applicable

7. Electrostatic Discharges (ESD)

7.1 Standard and Limit

According to the standard EN 55035 Clause 5, Table clause 1.4 , Limit as below:

Test Specifications	Test Level	Performance Criterion
Air Discharge	8kV	B
Contact Discharge	4kV	B

7.2 Test Procedure

According to the standard EN 55035 Clause 4.2.1, Test is conducting under the description of IEC 61000-4-2.

7.3 Test Results

Air Discharge	Test Level (kV)							
Test Points	-2	+2	-4	+4	-8	+8	-15	+15
Slots	A	A	A	A	A	A	-	-
Contact Discharge	Test Level (kV)							
Test Points	-2	+2	-4	+4	-6	+6	-8	+8
HCP	A	A	A	A	-	-	-	-
VCP	A	A	A	A	-	-	-	-

8. Continuous Radiated Disturbances (RS)

8.1 Standard and Limit

According to the standard EN 55035 Clause 5, Table clause 1.2 and 1.3 , Limit as below:

Test Specifications	Test Level	Performance Criterion
80MHz-1000MHz	3V/m	A
1.8GHz/2.6GHz/3.5GHz/5GHz	3V/m	A

8.2 Test Procedure

According to the standard EN 55035 Clause 4.2.2.2, Test is conducting under the description of IEC 61000-4-3.

8.3 Test Results

Frequency step: 1% of fundamental

Dwell time: 1 second

Modulation: AM by 1kHz sine wave with 80% modulation depth

Frequency Range	EM Field	Polarization	Front	Rear	Left	Right
80MHz-1GHz	3V/m	Horizontal	A	A	A	A
80MHz-1GHz	3V/m	Vertical	A	A	A	A
1.8GHz	3V/m	Horizontal	A	A	A	A
1.8GHz	3V/m	Vertical	A	A	A	A
2.6GHz	3V/m	Horizontal	A	A	A	A
2.6GHz	3V/m	Vertical	A	A	A	A
3.5GHz	3V/m	Horizontal	A	A	A	A
3.5GHz	3V/m	Vertical	A	A	A	A
5GHz	3V/m	Horizontal	A	A	A	A
5GHz	3V/m	Vertical	A	A	A	A

9. Electrical Fast Transients (EFT)

9.1 Standard and Limit

According to the standard EN 55035 Clause 4.2, Table clause 3.3 and 4.5, Limit as below:

Test Specifications	Test Level (5/50ns)	Performance Criterion
AC Power Port	1kV	B
DC Power Port	0.5kV	B

9.2 Test Procedure

According to the standard EN 55035 Clause 4.2.4, Test is conducting under the description of IEC 61000-4-4.

9.3 Test Results

Not applicable

10. Surges

10.1 Standard and Limit

According to the standard EN 55035 Clause 4.2, Table clause 3.2 and 4.4, Limit as below:

Test Specifications	Test Level (1.2/50us)	Performance Criterion
Line to Line	1kV	B
Line to Ground	2kV	B
DC Power Ports	0.5kV	B

10.2 Test Procedure

According to the standard EN 55035 Clause 4.2.5, Test is conducting under the description of IEC 61000-4-5.

10.3 Test Results

Not applicable

11. Continuous Conducted Disturbances (CS)

11.1 Standard and Limit

According to the standard EN 55035 Clause 5, Table clause 3.1 and 4.1, Limit as below:

Test Port	Test Specifications	Test Level	Performance Criterion
DC Port	0.15MHz-10MHz	3V	A
	10MHz-30MHz	3V-1V	A
	30MHz-80MHz	1V	A
AC Port	0.15MHz-10MHz	3V	A
	10MHz-30MHz	3V-1V	A
	30MHz-80MHz	1V	A

11.2 Test Procedure

According to the standard EN 55035 Clause 4.2.2.3, Test is conducting under the description of IEC 61000-4-6.

11.3 Test Results

Not applicable

12. Power Frequency Magnetic Fields (PFMF)

12.1 Standard and Limit

According to the standard EN 55035 Clause 4.2, Table clause 1.1, Limit as below:

Test Specifications	Test Level	Performance Criterion
50Hz	1A/m	A

12.2 Test Procedure

According to the standard EN 55035 Clause 4.2.3, Test is conducting under the description of IEC 61000-4-8.

12.3 Test Results

Magnetic Field Strength	Frequency	Position of Induction Coil	Result
1A/m	50Hz	X	A
1A/m	50Hz	Y	A
1A/m	50Hz	Z	A

13. Voltage Dips and Interruptions

13.1 Standard and Limit

According to the standard EN 55035 Clause 5, Table clause 4.2 and 4.3, Limit as below:

Residual Voltage	Number of Cycles for 50Hz	Performance Criterion
<5%	0.5	B
70%	25	C
<5%	250	C

13.2 Test Procedure

According to the standard EN 55035 Clause 4.2.6, Test is conducting under the description of IEC 61000-4-11.

13.3 Test Results

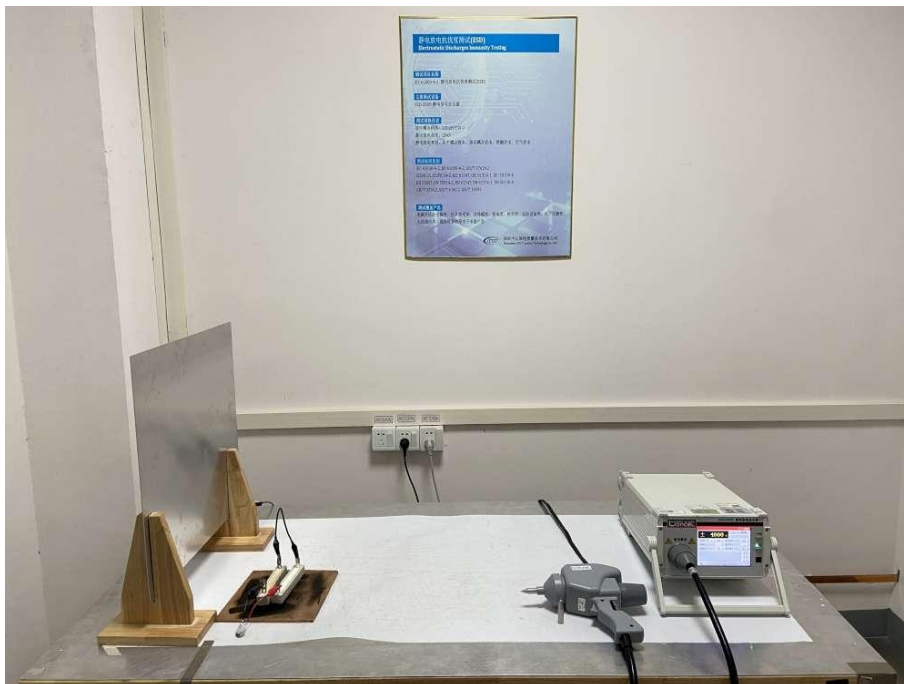
Not applicable

Annex A. Test Photos

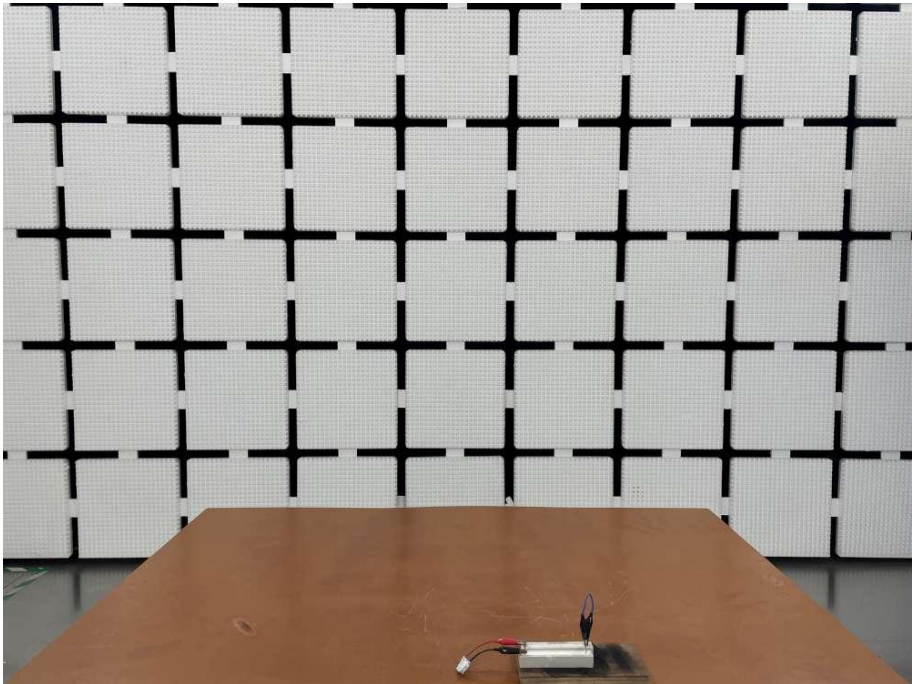
Radiated Emission Test View



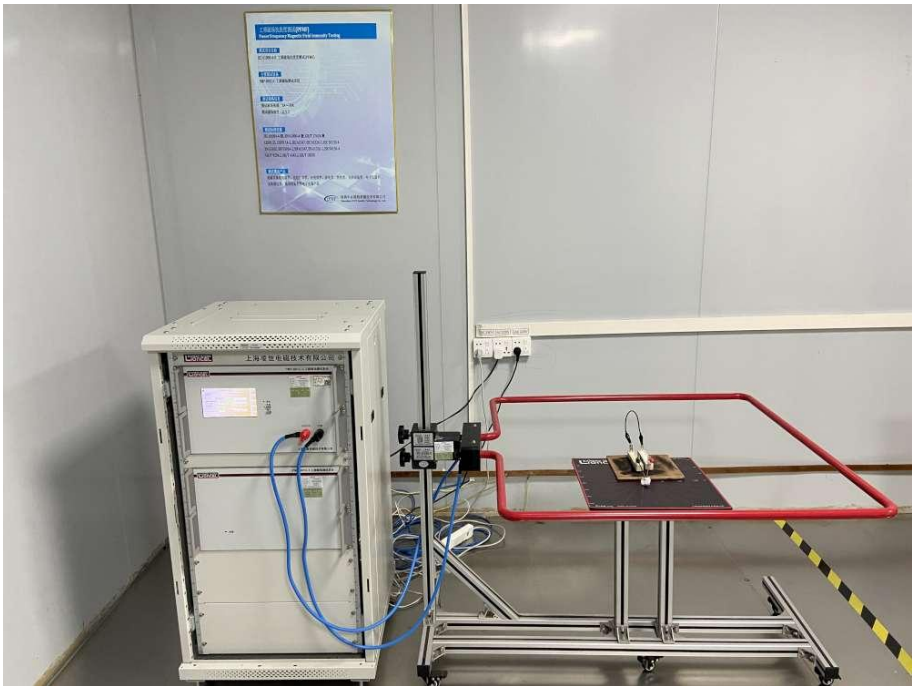
ESD Test View



RS Test View



PFMF Test View



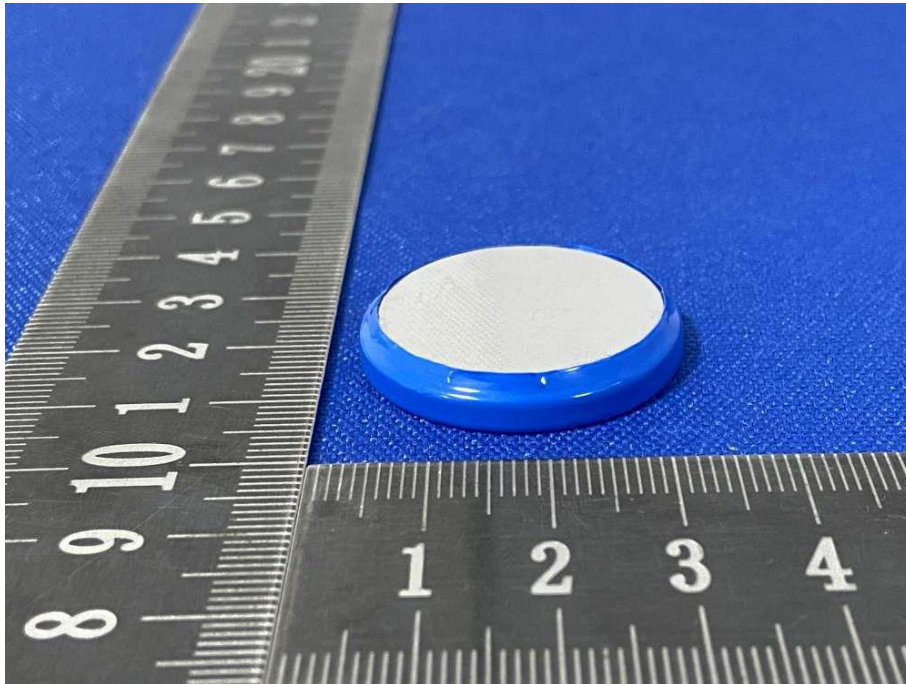
Annex B. EUT Photos

EUT View 1



EUT View 2



EUT View 3

******* END OF REPORT *******