TEST REPORT N°: CNDQ-ESH-P24100704B

EMC TEST REPORT

Applicant :	**V-TAC EXPORTS LIMITED**
Address :	FLAT/RM D-2 7/F WING CHEONG COMMERCIAL BLDG 19-25 JERVOIS STREET SHEUNG WAN HK
Manufacturer :	LEDXPRESS LIGHTING TECHNOLOGY CO.,LTD
Address :	Floor 1-6, Block E, No.10 Lefengsi Road, Henglan town, Zhongshan City, Guangdong Province, China
Factory :	LEDXPRESS LIGHTING TECHNOLOGY CO.,LTD
Address :	Floor 1-6, Block E, No.10 Lefengsi Road, Henglan town, Zhongshan City, Guangdong Province, China
This document includes : 42 pages	

Product :	Lithium Ion Batteries
Model name :	VT-12040-1, VT-10240W, VT-10240B, VT-10240B-1
Trade mark :	V-TAC Meaningful Innovation.
Rated voltage :	51.2Vdc
Rated capacity :	200Ah, 10.24KWh
Highest clock frequency :	⩽108 MHz
Protection class :	--
Tests realised :	On one sample of VT-12040-1
Test date :	Oct.11 to 14, 2024

Standards used (date) :	EN IEC 61000-6-4:2019 EN IEC 61000-6-3:2021 EN IEC 61000-6-2:2019 EN IEC 61000-6-1:2019
Clauses examined :	All Clauses Relevant.

CONCLUSION :The sample does satisfy the clauses examined .

Test done by:	Approved by:
Name : Able ZHAO Date : Nov.7, 2024	Name : Wen ZHU Date : Nov.7, 2024

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/ and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

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TEST REPORT N°: CNDQ-ESH-P24100704B
Release control record

Report No.	Description	Date Issued
CNDQ-ESH-P24100704B	Original release	07/11/2024

1 Summary of test results

No.	Item	Result
Emission part:		
1	Continuous disturbances	N/A
2	Discontinuous disturbances	N/A
3	Radiated emission	PASS
4	Harmonic current emission	N/A
5	Voltage fluctuation and flicker	N/A
Immunity part:		
6	Electrostatic discharge	PASS
7	RF electromagnetic fields	PASS
8	Electrical fast transient/Burst	PASS
9	Surge	N/A
10	Injected current	N/A
11	Power frequency magnetic field	PASS
12	Voltage dips and short interruptions	N/A

2 General information of laboratory

2.1 Test facility

☒ The tests done in this report are subcontracted to :

Laboratory name: KSIGN(Guangdong) Testing Co., Ltd.

Testing location: West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China (CNAS L13261)

2.2 Measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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

This lab's measurement uncertainty ULab, is low than UCispr , Table 1 – Values of UCispr of CISPR 16-4-2, therefore compliance is deemed to occur if no measured disturbance exceeds the disturbance limit.

Measurement		Value
Disturbance voltage		3.16 dB
Radiated disturbance (3 m)	30 MHz ~200 MHz	4.51 dB
	200 MHz ~1000 MHz	5.01 dB
	1 GHz ~ 6 GHz	3.74 dB
	6 GHz ~ 18 GHz	3.66 dB

3 General product information

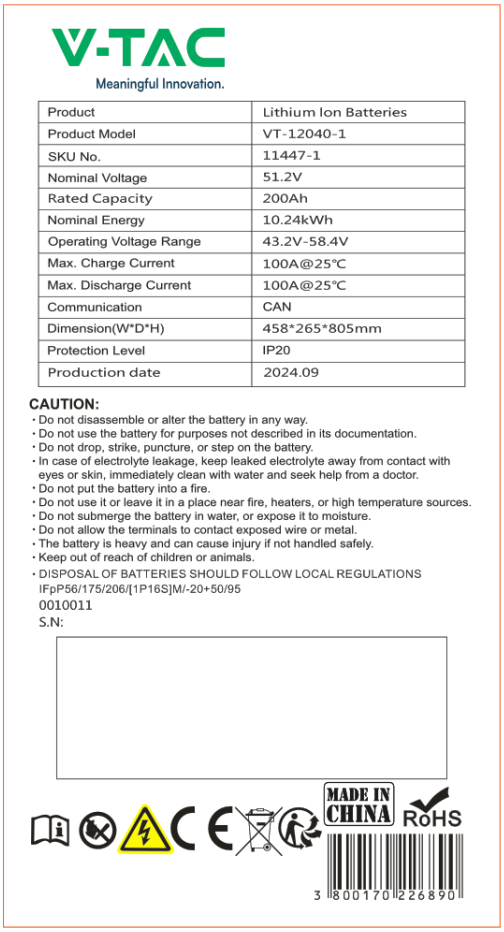
3.1 Specification of product

Operating modes:
☒ Mode A: Charging mode.
☒ Mode B: Discharging mode.
☐ Mode C:

Types of port:
☐ AC power port
☒ DC power port
☒ wired network port: LAN port for BMS
☐ signal/control port
☒ enclosure port

Special comments: All models are similar as each other except the mechanical components and color. So all EMC tests were performed on model VT-12040-1 without WIFI function, the test result is applicable to all models.

Rating label:



3.2 Description of auxiliary equipment and associated equipment

N/A

3.3 Operation conditions

The EUT operating and testing at below conditions:

Ambient conditions:	Temperature	:	24.5.0-25.5 °C
	Relative humidity	:	45.0-50.0 %
	Atmospheric pressure	:	101.0 kPa

3.4 Photograph of sample

Refer to Appendix A

4 Test instruments

Radiated Emissions Measurement At Frequencies Between 30 MHz to 1GHz						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Used this time
1	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	01/29/2025	√
2	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	01/21/2025	√
3	EMI Test Receiver	R&S	ESR3	102525	01/21/2025	√

Electrostatic Discharge Immunity						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Used this time
1	ESD Simulator	TESEQ	NSG 437	1364	01/22/2025	√

Radio-frequency electromagnetic field.（RS）						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Used this time
1	RF Switch	JS TOYO	NS 4903	1901-214	01/21/2025	√
2	Signal Generator	Agilent	N5181A	MY50141283	01/21/2025	√
3	Power Meter	Agilent	E4419	GB40202778	01/21/2025	√
4	Power Sensor	Agilent	E9304A	MY50390009	01/21/2025	√
5	Power Sensor	Agilent	E9300A	MY41498315	01/21/2025	√
6	Transmit Antenna	Schwarzbeck	VULP 9118 E	00996	01/22/2025	√
7	Transmit Antenna	Schwarzbeck	STLP 9149	00652	01/22/2025	√
8	Power Amplifier	Vectawave	VBA1000-150	123821	01/21/2025	√
9	Dual Directional Coupler	Werlatone	C5597-10	118142	01/21/2025	√
10	Power Amplifier	Milmega	AS0706-50	1085571	01/21/2025	√

Electrical Fast Transient/burst Immunity						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Used this time
1	Test Host	LIONCEL	LSG-433C-05AC	433C05AC -0231102	01/21/2025	√
2	Coupled network	LIONCEL	CDN-4320H-200AC	CDN-4320H-200AC-0230901	01/21/2025	√

Power Frequency Magnetic Field Immunity						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Used this time
1	Test Host	EMC partner	IMU4000 F-S-D	106754-2085	01/21/2025	√
2	Magnetic Field Coil	EMC partner	MF1000-1	1605	01/21/2025	√

5 Test procedure and results for emission

5.1 Continuous disturbances, AC mains port (150kHz – 30 MHz)

5.1.1 Test condition

Applicable Standard:	**EN IEC 61000-6-4:2019, EN IEC 61000-6-3:2021**	
Test setup description:	☐	Setup Type A (40 cm distance to vertical ground plane, 80 cm over ground plane)
	☐	Setup Type B (40 cm distance to horizontal ground plane)
	☐	Floor standing equipment setup (10 cm over ground plane)
	☐	Other: --
	☐	Artificial hand applied
Test method applied:	☐	Artificial mains network
	☐	Other: --
Remark:	--	

Limits for conducted emissions - low voltage AC mains port		
Frequency range (MHz)	**Quasi-peak (dBµV)**	**Average (dBµV)**
0.15-0.5	79	66
0.5-30	73	60

Limits for conducted emissions - low voltage AC mains port		
Frequency range (MHz)	**Quasi-peak (dBµV)**	**Average (dBµV)**
0.15-0.5	66-56	56-46
0.5-5	56	46
5-30	60	50

5.1.2 Test results

N/A

5.2 Continuous disturbances, DC power port (150kHz – 30 MHz)

5.2.1 Test condition

Applicable Standard:	EN IEC 61000-6-4:2019, EN IEC 61000-6-3:2021	
Test setup description:	☐	Setup Type A (40 cm distance to vertical ground plane, 80 cm over ground plane)
	☐	Setup Type B (40 cm distance to horizontal ground plane)
	☐	Floor standing equipment setup (10 cm over ground plane)
	☐	Other: --
	☐	Artificial hand applied
Test method applied:	☐	Artificial mains V-network
	☐	Artificial Δ-network
	☐	Other: --
Remark:	The total length of the cable which connected to DC power port does not exceed 3 m according to the manufacturer's functional specification.	

EN IEC 61000-6-4:2019 Limits for conducted emissions - DC power port		
Frequency range (MHz)	**Quasi-peak (dBμV)**	**Average (dBμV)**
0.15-0.5	89	76
0.5-30	83	70

EN IEC 61000-6-3:2021 Limits for conducted emissions - DC power port		
Measurement network: V-AN		
Frequency range (MHz)	**Quasi-peak (dBμV)**	**Average (dBμV)**
0.15-0.5	79	66
0.5-30	73	60
Measurement network: Δ-AN		
Frequency range (MHz)	**Quasi-peak (dBμV)**	**Average (dBμV)**
0.15-0.5	84-74	74-64
0.5-30	74	64

5.2.2 Test results

N/A

5.3 Continuous disturbances, other wired ports (150kHz – 30 MHz)

5.3.1 Test condition

Applicable Standard:	**EN IEC 61000-6-3:2021**	
Test setup description:	☐	Setup Type A (40 cm distance to vertical ground plane, 80 cm over ground plane)
	☐	Setup Type B (40 cm distance to horizontal ground plane)
	☐	Floor standing equipment setup (10 cm over ground plane)
	☐	Other: --
	☐	Artificial hand applied
Test method applied:	☐	Current probe
	☐	Capacitive voltage probe (CVP)
	☐	ISN
	☐	Other: --
Remark:	The total length of the cable which connected to LAN port for BMS does not exceed 3 m according to the manufacturer's functional specification.	

EN IEC 61000-6-3:2021 Limits for conducted emissions - other wired ports				
Frequency range (MHz)	**Voltage limits**		**Current limits**	
	Quasi-peak (dBµV)	**Average (dBµV)**	**Quasi-peak (dBµA)**	**Average (dBµA)**
0.15-0.5	84-74	74-64	40-30	30-20
0.5-30	74	64	30	20

5.3.2 Test results

N/A

5.4 Discontinuous disturbances (9 kHz – 30 MHz)

5.4.1 Test condition

Applicable Standard:	**EN IEC 61000-6-4:2019 / EN IEC 55014-1:2021 EN IEC 61000-6-3:2021 / EN IEC 55014-1:2021**	
Test setup description:	☐	Setup Type A (40 cm distance to vertical ground plane, 80 cm over ground plane)
	☐	Setup Type B (40 cm distance to horizontal ground plane)
	☐	Floor standing equipment setup (10 cm over ground plane)
	☐	Other: --
	☐	Artificial hand applied
CDN applied:	☐	Artificial mains network
	☐	Other: --
Applied method for discontinuous disturbances:	☐	Click rate determined on base of switching operations
	☐	Click rate determined on base of clicks measurements
	☐	Other: --
Remark:	The EUT is powered by DC.	

5.4.2 Test results

N/A

5.5 Radiated emission (below 1GHz)

5.5.1 Test condition

Applicable Standard:	EN IEC 61000-6-4:2019, EN IEC 61000-6-3:2021	
Test set up description:	☒	Equipment on a table of 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other (e.g. height of pallet):
Supplementary test set-up description for **SAC**:	Measurements were made in semi-anechoic chamber that complies to CISPR 16. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements with quasi-peak detector for below 1GHz were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Test method applied (30 MHz to 1000 MHz):	☒	OATS or SAC with measurement distance [m]: 3 m
	☐	TEM Waveguide according to IEC 61000-4-20
	☐	FAR with measurement distance [m]: 3 m
Remark:	--	

EN IEC 61000-6-4:2019 Limits for SAC 3 m distance	
Frequency range (MHz)	**Quasi-peak (dBµV/m)**
30-230	50
230-1000	57

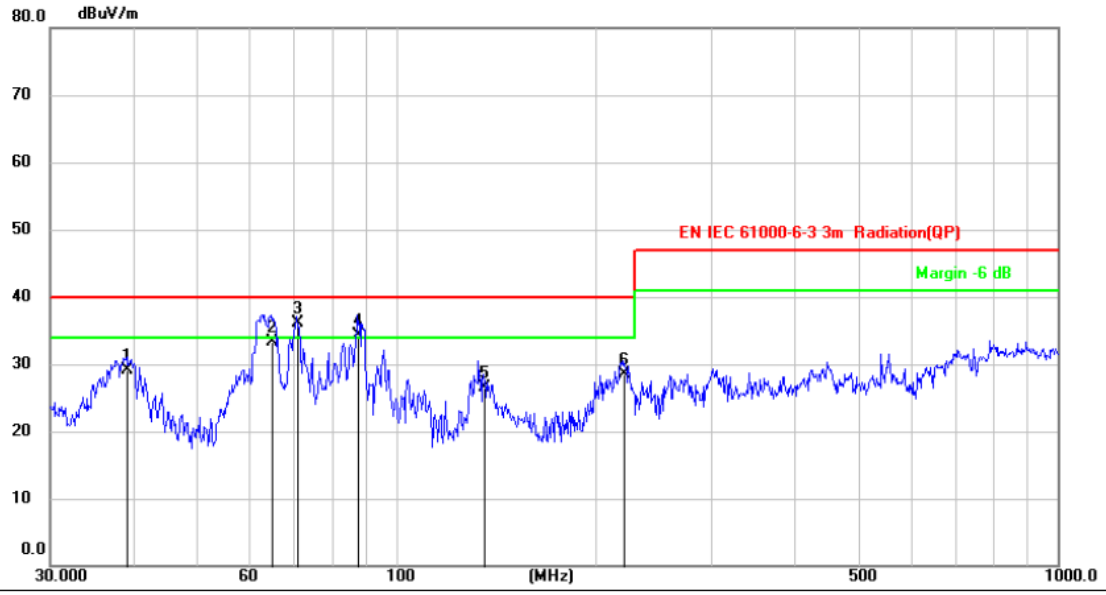
EN IEC 61000-6-3:2021 Limits for SAC 3 m distance	
Frequency range (MHz)	**Quasi-peak (dBµV/m)**
30-230	40
230-1000	47

5.5.2 Test results

Model:	VT-12040-1
Test mode:	Mode A
Test voltage:	DC 58.4V
Remark:	Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		45.8230	33.23	-10.75	22.48	40.00	-17.52	QP
2		61.7563	33.64	-9.76	23.88	40.00	-16.12	QP
3		70.5835	39.10	-12.46	26.64	40.00	-13.36	QP
4		98.8324	36.75	-11.87	24.88	40.00	-15.12	QP
5	*	168.0004	42.13	-13.20	28.93	40.00	-11.07	QP
6		264.0966	42.41	-9.86	32.55	47.00	-14.45	QP

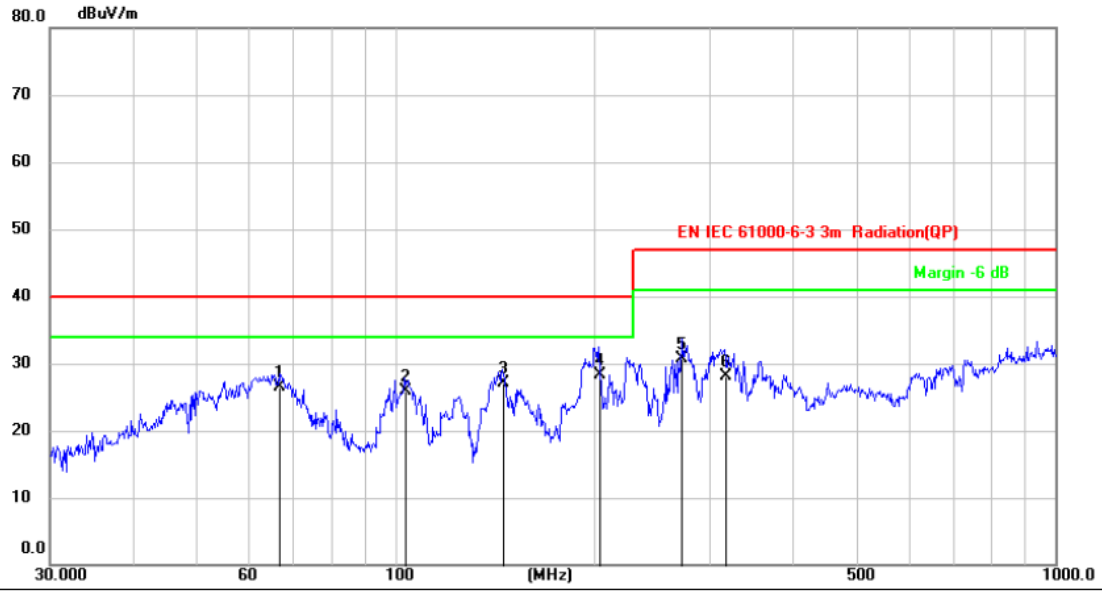
Model:	VT-12040-1
Test mode:	Mode A
Test voltage:	DC 58.4V
Remark:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		39.2714	40.23	-11.22	29.01	40.00	-10.99	QP
2		64.8636	43.65	-10.30	33.35	40.00	-6.65	QP
3	*	71.0554	48.73	-12.61	36.12	40.00	-3.88	QP
4	!	87.4788	48.12	-13.89	34.23	40.00	-5.77	QP
5		135.6012	40.67	-14.23	26.44	40.00	-13.56	QP
6		220.6945	39.59	-11.12	28.47	40.00	-11.53	QP

TEST REPORT N°: CNDQ-ESH-P24100704B

Model:	VT-12040-1
Test mode:	Mode B
Test voltage:	DC 51.2V
Remark:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		66.9431	37.72	-11.27	26.45	40.00	-13.55	QP
2		103.7326	37.73	-11.76	25.97	40.00	-14.03	QP
3		145.6562	41.18	-13.98	27.20	40.00	-12.80	QP
4	*	203.6655	40.02	-11.62	28.40	40.00	-11.60	QP
5		271.9912	40.12	-9.38	30.74	47.00	-16.26	QP
6		316.0341	35.63	-7.44	28.19	47.00	-18.81	QP

TEST REPORT N°: CNDQ-ESH-P24100704B

Model:	VT-12040-1
Test mode:	Mode B
Test voltage:	DC 51.2V
Remark:	Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		44.4463	39.42	-10.33	29.09	40.00	-10.91	QP
2		57.3318	37.64	-10.02	27.62	40.00	-12.38	QP
3	*	79.8281	48.73	-14.25	34.48	40.00	-5.52	QP
4		116.7035	41.58	-12.32	29.26	40.00	-10.74	QP
5		140.0961	40.91	-14.00	26.91	40.00	-13.09	QP
6		310.9775	39.30	-7.71	31.59	47.00	-15.41	QP

5.6 Radiated emission (above 1GHz)

5.6.1 Test condition

Applicable Standard:	**EN IEC 61000-6-4:2019, EN IEC 61000-6-3:2021**	
Test set up description:	☐	Equipment on a table of 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other:
Supplementary test set-up description for **SAC**:	Measurements were made in semi-anechoic chamber with RF absorber on the RGP which complies to CISPR 16. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements with peak and average detector were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Test method applied (1000 MHz to 6000 MHz):	☐	FSOATS with measurement distance [m]: 3 m
	☐	OATS with measurement distance [m]: 3 m
	☐	FAR with measurement distance [m]: 3 m
	☐	SAC with measurement distance [m]: 3 m
Remark:	The highest operation frequency is below 108MHz.	

EN IEC 61000-6-4:2019 Limits for 3 m distance		
Frequency range (MHz)	**Peak (dBµV/m)**	**Average (dBµV/m)**
1000 – 3000	76	56
3000 – 6000	80	60

EN IEC 61000-6-3:2021 Limits for 3 m distance		
Frequency range (MHz)	**Peak (dBµV/m)**	**Average (dBµV/m)**
1000 – 3000	70	50
3000 – 6000	74	54

5.6.2 Test results

N/A

5.7 Harmonics current emissions

5.7.1 Test condition

Applicable Standard:	**EN IEC 61000-6-3:2021 (EN IEC 61000-3-2:2019+A1:2021)**	
Test set up description:	Floor standing equipment set-up (10 cm over ground plane)	
Limit classification in accordance with the standard:	☐	Class A
	☐	Class B
	☐	Class C, rated power > 25 W
	☐	Class C, 5 W ≤ rated power ≤ 25 W
	☐	Class D
Observation period	2.5 min	
Remark:	The EUT is powered by DC.	

5.7.2 Test results

N/A

5.8 Voltage fluctuation and flicker

5.8.1 Test condition

Applicable Standard:	**EN IEC 61000-6-3:2021 (EN 61000-3-3:2013+A1:2019+A2:2021)**	
Test set up description:	Floor standing equipment set-up (10 cm over ground plane)	
Test method:	☐	4.2.2 Flickermeter according to IEC 61000-4-15
	☐	4.2.3 Simulation
	☐	4.2.4 Analytical method
	☐	4.2.5 Use of P_{st} = 1 curve
	☐	4.3 Long-Term flicker value P_{lt}
Observation time selected:	☐	10 Minutes
	☐	120 Minutes
	☐	24 times switching
	☐	Other: --
Limit for d_{max} applied:	☐	4 %
	☐	6 %
	☐	7 %
Remark:	The EUT is powered by DC.	

5.8.2 Test results

N/A

6 Test condition and results for immunity

6.1 General information

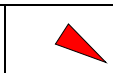
Performance criteria as defined by the standard EN IEC 61000-6-2:2019, EN IEC 61000-6-1:2019	
Criterion	**Description from standard**
A	The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
B	The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but 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, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
C	Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.
Other:	--

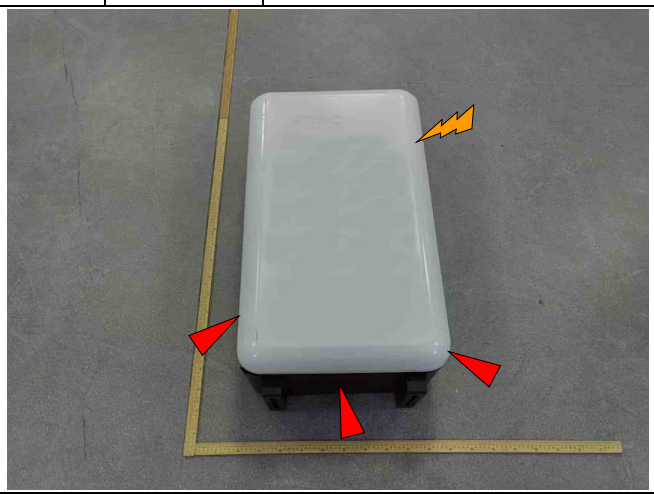
6.2 Electrostatic discharge immunity test (ESD)

6.2.1 Test condition

Basic standard:	**IEC 61000-4-2:2008 / EN 61000-4-2:2009**	
Test set up:	☐	Table-top equipment
	☐	Floor standing equipment
	☒	Wall or ceiling mounted equipment (Treated as table top)
Supplementary test set up description:	Measurements were made on a ground plane that extends 0.5 m minimum beyond all sides of the system under test and the minimum distance between the equipment under test and any laboratory walls or any other metallic surfaces shall be at least 1 m. Air discharges were applied to non-metallic parts of the system. Contact discharges were applied to all accessible metallic parts. Discharges were also applied to the Horizontal and Vertical Coupling Planes, where applicable.	
Discharge impedance:	330 ohm / 150 pF	
Size of horizontal coupling plate:	1.6 x 0.8 m	
Size of vertical coupling plate:	0.5 x 0.5 m	
Number of discharges for each test point:	10	
Discharge interval:	1 s	
Performance criterion:	B	
Remark:	--	

6.2.2 Test results

Operating mode:	Mode A and Mode B			
Ambient temperature:	22.1 ℃			
Relative humidity:	53.1 %			
Atmospheric pressure:	101.2 kPa			
Supplementary information:	--			
Location of discharge	**Test level (kV)**	**Polarity**	**Type**	**Observations**
Vertical coupling plate	2,4	+	Contact discharge	Note 1
Vertical coupling plate	2,4	-	Contact discharge	Note 1
Horizontal coupling plate	2,4	+	Contact discharge	Note 1
Horizontal coupling plate	2,4	-	Contact discharge	Note 1
Points on conductive surface as indicated in the picture below	2,4	+	Contact discharge	Note 1
Points on conductive surface as indicated in the picture below	2,4	-	Contact discharge	Note 1
Points on non-conductive surface as indicated in the picture below	2, 4, 8	+	Air discharge	Note 1
Points on non-conductive surface as indicated in the picture below	2, 4, 8	-	Air discharge	Note 1
Note 1: EUT worked as intended during and after test.				
Photos of test points:				
Symbols identifying discharge applied:		Contact discharge		
		Air discharge		



6.3 Radiated, Radio-frequency, Electromagnetic field immunity test (RS)

6.3.1 Test condition

Basic standard:	**IEC 61000-4-3:2020 / EN IEC 61000-4-3:2020**	
Test setup:	☒	Table-top equipment
	☐	Floor standing equipment
	☐	Other: --
Supplementary test set up description:	Measurements were made in a semi or full anechoic chamber or TEM or reverberation chamber and the indicated field strength was pre-calibrated prior to placement of the system under test. For semi or full anechoic chamber the tests were performed in both the horizontal and vertical polarities, where applicable. The antenna was placed between 1 and 3 m from the product under test.	
Antenna height:	1.5 m	
Distance antenna to EUT:	3 m	
Modulation:	80 % AM with 1 kHz	
Dwell time:	3 s	
Step size:	1%	
Applied testing method:	☒	IEC 61000-4-3 Radiated Field with Antenna
	☐	IEC 61000-4-22 Radiated emission and immunity measurements in fully anechoic rooms (FARs)
	☐	IEC 61000-4-20 Emission and immunity testing in transverse electromagnetic (TEM) waveguides
Performance criterion:	A	
Remark:	--	

6.3.2 Test results

Operating mode:	Mode A and Mode B
Supplementary information:	--

Frequency range	Test level (V/m)	Polarization	Azimuth	Modulation	Observations
80 MHz – 1000 MHz	3 & 10	Horizontal/ Vertical	0°	AM 1 kHz, 80 %	Note 1
			90°		
			180°		
			270°		
1.4 GHz – 6 GHz	3	Horizontal/ Vertical	0°	AM 1 kHz, 80 %	Note 1
			90°		
			180°		
			270°		
Note 1: EUT worked as intended during and after test.					

6.4 Electrical fast transient/Burst immunity test (EFT)

6.4.1 Test condition

Basic standard:	**IEC 61000-4-4:2012 / EN 61000-4-4:2012**	
Test setup:	☒	Table-top equipment
	☐	Floor standing equipment
	☐	Artificial hand applied
Supplementary test set up description:	The ground reference plane shall project beyond the EUT by at least 0.1 m on all sides. The minimum distance between the EUT and all other conductive structures (including the generator, AE and the walls of a shielded room), except the ground reference plane, shall be more than 0.5 m. All cables to the EUT shall be placed on the insulation support 0.1 m above the ground reference plane. Cables not subject to test shall be routed as far as possible from the cable under test to minimize the coupling between the cables. Either a direct coupling network or a capacitive clamp shall be used for the application of the test voltages.	
Test time:	1 min	
Repetition frequency:	5 kHz	
Impulse wave shape:	5/50 ns	
Burst duration:	15 ms for 5kHz repetition frequency	
Burst period:	300 ms	
Performance criterion:	B	
Remark:	The total length of the cable which connected to LAN port for BMS does not exceed 3 m according to the manufacturer's functional specification.	

6.4.2 Test results

Operating mode:	Mode A and Mode B
Supplementary information:	--

Port	Test line	Test level (kV)	Polarity	Coupling method	Observations
Input and Output DC power ports	Positive/ Negative polarity	0.5 & 1	+/-	CDN	Note 1
Note 1: EUT worked as intended during and after test.					

6.5 Surges

6.5.1 Test condition

Basic Standard:	**IEC 61000-4-5:2014+A1:2017 / EN 61000-4-5:2014+A1:2017**
Test set up description:	Floor standing equipment set-up (10 cm over ground plane)
Supplementary test set up description:	Tests were conducted with the product connected to a Coupling/Decoupling Network (CDN)
Wave-Shape:	1.2/50 μs open circuit voltage, 8/20 μs short circuit current
Repetition rate:	60 s
Number of pulses for each coupling:	5 positive and 5 negative
Performance criterion:	B
Remark:	The total length of the cable which connected to LAN port for BMS and DC power port does not exceed 3 m and the cable is inside a building according to the manufacturer's functional specification.

6.5.2 Test results

N/A

6.6 Immunity to conducted disturbances induced by RF fields (CS), 0.15 MHz to 80 MHz

6.6.1 Test condition

Basic Standard:	**IEC 61000-4-6:2013 / EN 61000-4-6:2014**	
Test setup:	☐	Equipment located (0,1 ± 0,05) m above ground plane
	☐	Elevated ground plane.
	☐	Artificial hand applied.
Supplementary test set up description:	Measurements were made on a ground plane that extends 0.5 m minimum beyond all sides of the system under test. The EUT was located 0.1 m above the reference ground plane and any associated cables attached to the EUT were located between 30 - 50mm above the ground plane. The indicated field was pre-calibrated prior to placement of the system under test.	
Modulation:	80 % AM with 1 kHz	
Dwell time:	3 s	
Step size:	1%	
Performance criterion:	A	
Remark:	The total length of the cable which connected to LAN port for BMS and DC power port does not exceed 3 m and the cable is inside a building according to the manufacturer's functional specification.	

6.6.2 Test results

N/A

6.7 Power frequency magnetic field

6.7.1 Test condition

Basic standard:	**IEC 61000-4-8:2009 / EN IEC 61000-4-8:2010**	
Test setup:	☒	Single Coil. Dimensions: 1 x 1 m
	☐	Single Coil. Dimensions: 1 x 2.6 m
	☐	0,1 m above metal surface
	☐	Homogeneous field (Helmholtz coil). Dimensions:
	☐	Radiating loop swept along test item surface
Supplementary test set up description:	All cables shall be exposed to the magnetic field for 1 m of their length.	
Performance criterion:	A	
Remark:	--	

6.7.2 Test results

Operating mode:	Mode A and Mode B			
Supplementary information:	--			
Axis	**Test frequency (Hz)**	**Test level (A/m)**	**Duration (s)**	**Observations**
X	50	3 & 30	60	Note 1
Y	50	3 & 30	60	Note 1
Z	50	3 & 30	60	Note 1
Note 1: EUT worked as intended during and after test.				

6.8 Voltage dips and short interruptions

6.8.1 Test condition

Basic Standard:	**IEC 61000-4-11:2020 / EN IEC 61000-4-11:2020**
Test set up description:	Floor standing equipment set-up (10 cm over ground plane)
Supplementary test set up description:	Testing was performed with the product connected directly to a generator capable of simulating the voltage drops.
Repetition rate:	10 s
Number of dips or interruptions:	3
Performance criterion:	B for voltage dips C for voltage interruptions
Remark:	The EUT is powered by DC.

6.8.2 Test results

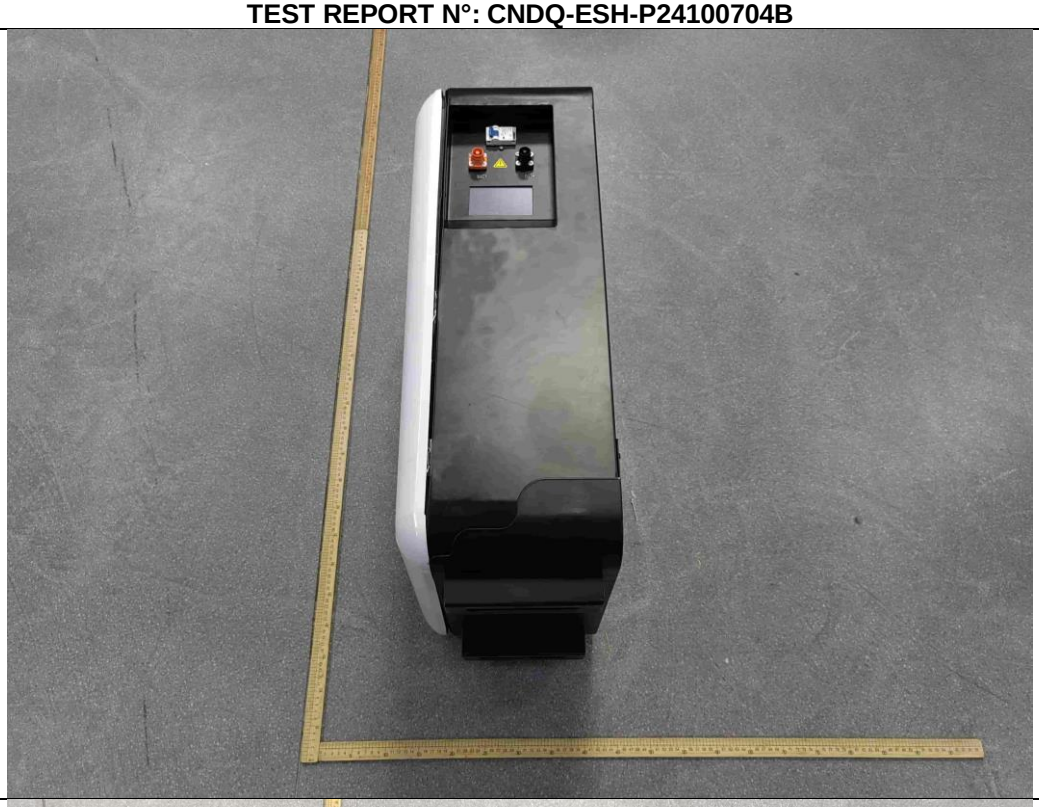
N/A

7 Conclusion

The apparatus Lithium Ion Batteries and models VT-12040-1, VT-10240W, VT-10240B, VT-10240B-1 are in compliance with the requirements of the standards EN IEC 61000-6-4:2019, EN IEC 61000-6-3:2021, EN IEC 61000-6-2:2019 and EN IEC 61000-6-1:2019.

Appendix A: Photograph of sample

VT-12040-1



VT-10240W

VT-10240B

VT-10240B-1