

Shenzhen CTL Testing Technology Co., Ltd. Tel: +86-755-89486194 E-mail: ctl@ctl-lab.com

<b>TI</b> F	EST REPORT	•
Report Reference No.:	CTL1908212031-WF	
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Tested by: ( position+printed name+signature)	Nice Nong (Test Engineer)	Nice Nong
Approved by: ( position+printed name+signature)	Ivan Xie (Manager)	from Nie
Product Name	Vault c-smart wireless 26950mah p	power pack
Model/Type reference	RMC99701	
List Model(s)	N/A	
Trade Mark	Ridgemonkey	
FCC ID	2AULO-RMC99701	
Applicant's name:	Q & M Industrial Company Limite	ed
Address of applicant	RM 1405A 14/F LUCKY CTR 165-171 WANCHAI RD WANCHAI HONGKONG	
Test Firm	Shenzhen CTL Testing Technolo	ogy Co., Ltd.
Address of Test Firm	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055	
Test specification		
Standard:	FCC Rules Part 15.207,15.209, 14 ANSI C63.10-2013	5.215(c)
TRF Originator	Shenzhen CTL Testing Technology Co., Ltd.	
Master TRF	Dated 2011-01	
Date of Receipt	Sep. 13, 2019	
Date of sampling	Sep. 13, 2019	
Date of Test Date	Sep. 13, 2019–Sep. 22, 2019	
Data of Issue	Sep. 26, 2019	
Result	Pass	
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V1.0

# **TEST REPORT**

Test Report No. :	CTL1	908212031-WF	Sep. 26, 2019 Date of issue
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Equipment under Test	:	Vault c-smart wireless	26950mah power pack
Model /Type	:	RMC99701	
Listed Models	. <	N/A	
Applicant		Q & M Industrial Con	npany Limited
Address	:	RM 1405A 14/F LUCK WANCHAI HONGKON	(Y CTR 165-171 WANCHAI RD NG
Manufacturer	:	Q & M Industrial Con	npany Limited
Address	:	RM 1405A 14/F LUCK WANCHAI HONGKON	(Y CTR 165-171 WANCHAI RD NG

Test result	Pass *
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\*In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# \*\* Modified History \*\*

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2019-09-26	CTL1908212031-WF	Tracy Qi
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				NAP.











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## 1. SUMMARY

### **1.1. TEST STANDARDS**

The tests were performed according to following standards: FCC Rules Part 15.207,15.209, 15.215(c)

ANSI C63.10: 2013: American National Standard for Testing Unlicensed Wireless Devices

### **1.2. Test Description**

Test Item	Test Standards	Test Result
Electric Field Radiated Emissions	FCC Part 15 C (Section15.209)	PASS
20dB Bandwidth/99% Bandwidth	FCC Part 15 C (Section15.215(c))	PASS
Conducted Emissions	FCC Part 15 C (Section15.207)	PASS





### 1.3. Test Facility

#### 1.3.1Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd. Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

#### 1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### IC Registration No.: 9518B

#### CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9518B on Jan. 22, 2019.

#### FCC-Registration No.: 399832

#### **Designation No.: CN1216**

Shenzhen CTL Testing Technology 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 399832, December 08, 2017.

### 1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Test	Measurement Uncertainty	Notes	
Transmitter power conducted	±0.57 dB	(1)	
Transmitter power Radiated	±2.20 dB	(1)	
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)	
Occupied Bandwidth	±0.01ppm	(1)	
Radiated Emission 30~1000MHz	±4.10dB	(1)	
Radiated Emission Above 1GHz	±4.32dB	(1)	

Hereafter the best measurement capability for CTL laboratory is reported:

Conducted Disturbance0.15~30MHz	±3.20dB	(1)
(1) This uncertainty represents an expanded uncertainty exconfidence level using a coverage factor of k=2.	xpressed at approximately th	e 95%









## 2. GENERAL INFORMATION

## 2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

## 2.2. General Description of EUT

Product Name:	Vault c-smart wireless 26950mah power pack	
Model/Type reference:	RMC99701	
Input :	USB-C:DC5V/3A 9V/2A 15V-2A 20V-1.5A	
Output:	USB-C :DC5V/3A 9V/2A 15V-2A 20V-1.5A Wireless output:DC5V/1.5A 9V/1.1A 2Xusb output:DC5V/2.4A 12V Socket output:DC12V/5A	
Operation frequency:	115KHz~205KHz	
Antenna type:	Loop Antennas	
Antenna gain:	OdBi	

Note: For more details, please refer to the user's manual of the EUT.

## 2.3. Special Accessories

Manufacturer	Description	Model	Serial Number	Provided by laboratories	Note
ASUS	Notebook PC	FL5900U	9014	Yes	/
Samsung	Phone	Galaxy s7	35615607721414	Yes	/
HUAWEI	adapter	HW-200325CP0	C973Y1K2N01930	Yes	Input:100-240V~ 50/60Hz,1.8A Output:5V/2A,9V /2A,12V/2A,15V/ 3A,20V/3.25A

## 2.4. Test Mode

Test Mode	
Mode1	Battery powered
Mode2	USB power supply (Other voltages have been tested and 20V-1 .5 A is the worst mode.)





## 2.5. Equipments Used during the Test

Test Equipment Manufacturer		Model No.	Serial No.	Calibration Date recent	Calibration Due Date
LISN	R&S	ENV216	3560.6550.12	2019/05/20	2020/05/19
LISN	R&S	ESH2-Z5	860014/010	2019/05/20	2020/05/19
Power Meter	Agilent	U2531A	TW53323507	2019/05/20	2020/05/19
Power Sensor	Agilent	U2021XA	MY5365004	2019/05/20	2020/05/19
EMI Test Receiver	R&S	ESCI	103710	2019/05/20	2020/05/19
Spectrum Analyzer	Agilent	E4407B	MY41440676	2019/05/20	2020/05/19
Spectrum Analyzer	Agilent	N9020	US46220290	2019/05/20	2020/05/19
Controller	EM Electronics	Controller EM 1000	N/A	2019/05/20	2020/05/19
Active Loop Antenna	Daze	ZN30900A	N/A	2019/05/20	2020/05/19
Bilog Antenna	Schwarzbeck	VULB 9168	00824	2019/05/20	2020/05/19
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2019/05/20	2020/05/19
Horn Antenna	SCHWARZBACK	BBHA 9170	BBHA9170184	2019/05/20	2020/05/19
Amplifier	Agilent	8349B	3008A02306	2019/05/20	2020/05/19
Amplifier	Agilent	8447D	2944A10176	2019/05/20	2020/05/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2019/05/20	2020/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2019/05/20	2020/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2019/05/20	2020/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2019/05/20	2020/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2019/05/20	2020/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2019/05/20	2020/05/19
RF Cable	Megalon	RF-A303	N/A	2019/05/20	2020/05/19
EMI Test Software	R&S	ES-K1	V1.7.1	2019/05/20	2020/05/19
EMI Test Software	AUDIX	E3	V6.0	2019/05/20	2020/05/19

The calibration interval was one year

## 2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with FCC Part 15, Subpart C Rules.

### 2.7. Modifications

No modifications were implemented to meet testing criteria.



# 3. TEST CONDITIONS AND RESULTS

## 3.1. Conducted Emissions Test

### <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Fraguanay ranga (MHz)	Limit (dBuV)				
	Quasi-peak	Average			
0.15-0.5	66 to 56*	56 to 46*			
0.5-5	56	46			
5-30	60	50			

\* Decreases with the logarithm of the frequency.

### **TEST CONFIGURATION**



#### TEST PROCEDURE

- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
- 2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
- 4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5. All support equipments received AC power from a second LISN, if any.
- 6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.

#### **TEST RESULTS**

Note: Both power supply modes have been tested, and the following data are the worst



MEASUREMENT RESULT: "CTL190916104 fin"

2019-9-16 10:12?? Frequency Level Transd Limit Margin Detector Line PE dB  $dB\,\mu V$ MHz dBμV dB 0.172500 51.90 11.2 12.9 65 QP L1GND 0.217500 41.70 11.2 21.2 63 L1GND QΡ 17.061000 33.70 11.3 60 26.3 QP L1GND 17.425500 34.40 11.3 60 25.6 QΡ L1GND 17.493000 25.9 34.10 11.3 60 QΡ L1GND 17.772000 27.2 32.80 11.3 60 L1GND QΡ

#### MEASUREMENT RESULT: "CTL190916104 fin2"

2019-9-16	10:12??						
Frequency	y Level	Transd	Limit	Margin	Detector	Line	PE
MH	z dBµV	dB	dBμV	dB			
0.16800	0 38.00	11.2	55	17.1	AV	L1	GND
24.76050	0 29.70	11.6	50	20.3	AV	L1	GND
25.20600	0 26.00	11.6	50	24.0	AV	L1	GND
26.38050	0 31.10	11.7	50	18.9	AV	L1	GND
27.26700	0 29.30	11.7	50	20.7	AV	L1	GND
28.88700	0 29.50	11.7	50	20.5	AV	L1	GND







#### MEASUREMENT RESULT: "CTL190916103 fin"

2019-9-16 10	:09??						
Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
MHz	dBμV	dB	dBμV	dB			
0.172500	52.40	11.2	65	12.4	QP	Ν	GND
0.240000	42.00	11.2	62	20.1	QP	N	GND
0.357000	37.40	11.2	59	21.4	QP	Ν	GND
0.483000	35.70	11.2	56	20.6	QP	N	GND
1.734000	33.70	11.3	56	22.3	QP	Ν	GND
17.713500	34.50	11.3	60	25.5	QP	Ν	GND

#### MEASUREMENT RESULT: "CTL190916103 fin2"

2019-9-16 10: Frequency MHz	09?? Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.172500 0.244500 0.357000 1.027500 27.874500	38.90 26.90 27.60 23.50 23.70	11.2 11.2 11.2 11.3	55 52 49 46	15.9 25.0 21.2 22.5 26.3	AV AV AV AV	N N N N	GND GND GND GND





### 3.2. Radiated Emissions

### Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)					
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)					
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)					
1.705-30	3	20log(30)+ 40log(30/3)	30					
30-88	3	40.0	100					
88-216	3	43.5	150					
216-960	3	46.0	200					
Above 960	3	54.0	500					

Radiated emission limits

#### **TEST CONFIGURATION**

1. Radiated Emission Test Set-Up, Frequency Below 30MHz



2. Radiated Emission Test Set-Up, Frequency below 1000MHz

Receiver





#### Test Procedure

- 1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measurements have been completed.
- 5. Radiated emission test frequency band from 9KHz to 1000MHz.
- 6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3

7. Setting test receiver/spectrum as following table states:

Test Frequency	Test Receiver/Spectrum Setting	Detector
range		
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP

### Test Results

### WORST-CASE RADIATED EMISSION BELOW 30 MHz

	Wode1												
Frequency	Reading	Polar	Antenna Factor	Cable Loss	Emission Levels	Limits at 3m	Margin	Detector Mode					
(MHz)	(dBµV/m)	Loop	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)						
0.1274(F)	55.56	Loop	23.64	0.01	79.21	105.74	26.53	PK					
0.1274(F)	44.92	Loop	23.64	0.01	68.57	85.74	17.17	AV					
0.110	37.02	Loop	23.55	0.01	60.58	106.78	46.20	PK					
0.110	31.65	Loop	23.55	0.01	55.21	86.78	31.57	AV					
0.495	25.36	Loop	25.07	-0.17	50.26	73.71	23.45	QP					
1.654	16.91	Loop	27.12	-0.25	43.78	63.23	19.45	QP					
2.418	16.94	Loop	23.91	-0.24	40.61	69.54	28.93	QP					

				wode2				
in Detec Mod	Margin	Limits at 3m	Emission Levels	Cable Loss	Antenna Factor	Polar	Reading	Frequency
)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(dB/m)	Loop	(dBµV/m)	(MHz)
2 <b>PK</b>	27.42	105.74	78.32	0.01	23.64	Loop	58.12	0.127(F)
7 <b>AV</b>	17.07	85.74	68.67	0.01	23.64	Loop	48.36	0.127(F)
3 <b>PK</b>	46.03	106.78	60.75	0.01	23.55	Loop	37.19	0.110
2 <b>AV</b>	31.42	86.78	55.36	0.01	23.55	Loop	31.80	0.110
) <b>QP</b>	13.30	73.71	60.41	-0.17	25.07	Loop	35.51	0.495
) <b>QP</b>	19.40	63.23	43.83	-0.25	27.12	Loop	16.96	1.654
3 <b>QP</b>	28.78	69.54	40.76	-0.24	23.91	Loop	17.09	2.418

Remark:

- 1. Data of measurement within this frequency range shown "-- in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits and not recorded.
- 2. The test limit distance is 3m limit.
- 3. PK means Peak Value, QP means Quasi Peak Value, AV means Average Value.
- 4. F means Fundamental Frequency.
- 5. Emission level (dBuV/m) =Reading + Antenna Factor + Cable Loss.
- 6. Margin value = Limit value- Emission level.

#### For 30MHz-1GHz

Note: Both power supply modes have been tested, and the following data are the worst



Frequency MHz	Level dB礦/m	Transd dB	Limit dB礦/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	18.90	14.3	40.0	21.1		0.0	0.00	VERTICAL
55.220000	17.50	13.8	40.0	22.5		0.0	0.00	VERTICAL
154.160000	19.90	15.2	43.5	23.6		0.0	0.00	VERTICAL
173.560000	17.40	13.7	43.5	26.1		0.0	0.00	VERTICAL
555.740000	23.50	19.2	46.0	22.5		0.0	0.00	VERTICAL
945.680000	29.60	24.2	46.0	16.4		0.0	0.00	VERTICAL

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### 3.3. 20dB Bandwidth

### <u>Limit</u>

The 20dB bandwidth shall be less than 80% of the permitted frequency band.

#### **Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### **Test Configuration**



### Test Results

_		Mod	le1	
	Frequency (MHz)	20dB bandwidth (KHz)	99% OBW (KHz)	Result
	0.1274	2.878	2.794	Pass

Keysight Spectrum Analyzer - Occupied B	w					-   6 💽	
Center Freq 127.400 kHz	Cente Trig:	Center Freq: 127.400 kHz Trig: Free Run Avg Hold: 10/10		05:21:09 PM Sep 12, 2019 Radio Std: None		Frequency	
	#IFGain:Low #Atter	n: 30 dB	Rad	o Device: BTS			
Ref Offset 1 dB 10 dB/div Ref 20.00 dB	m						
10.0 0.00					Ce	enter Freq	
-10.0							
30.0	~~			~~~~			
-50.0							
-60.0							
Center 127.4 kHz #Res BW 1 kHz	Span 10 kł #VBW 3 kHz Sweep 12.4 n			Span 10 kHz veep 12.4 ms		CF Step	
Occupied Bandwid	th	Total Power	-3.38 dB	n	<u>Auto</u>	Man	
	2.797 kHz				Fr	req Offset	
Transmit Freq Error	-202 Hz	% of OBW Pow	ver 99.00	%		0 Hz	
x dB Bandwidth	2.878 kHz	x dB	-20.00 d	в			





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Mode2					
20dB bandwidth (KHz)	99% OBW (KHz)	Result			
2.687	2.386	Pass			
	20dB bandwidth (KHz) 2.687	20dB bandwidth (KHz) 99% OBW (KHz)   2.687 2.386			







# 4. Test Setup Photos of the EUT























## 5. Photos of the EUT











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\* End of Report \*

