FCC RF Exposure Exemption report

for

RFID Reader

Model No.: RF-009V+

FCC ID: 2BEZORF009VPLUS

of

Applicant: Sunion Technology Co., Ltd.
Address: 6F., No. 69, Sec. 2, Guangfu Rd., Sanchong Dist.,
New Taipei City 24158, Taiwan (R.O.C.)

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A

Report No.: W6M22401-23214-EE

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
TEL: 886-2-66068877 FAX: 886-2-66068879 E-mail: wts@wts-lab.com

Registration number: W6M22401-23214-EE
FCC ID: 2BEZORF009VPLUS

TABLE OF CONTENTS

1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.
The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.
Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.
Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.
The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that is performance generally conforms to representative cases of communications equipment.

Laboratory disclaimer-
1. The test results of this test report relate exclusively to the item tested as specified in 1.5.
2. The test report may only be reproduced or published in full.
3. Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.
4. Antenna gain is provided by applicant and laboratory issue relevant data and results.

Tester:

Date	WTS-Lab.	Name	Signature
February 19, 2024		Sora Kuo	Sora.

Technical responsibility for area of testing:

Date	WTS	Name	Signature
February 19, 2024		Kevin Wang	Kevin Wang

Registration number: W6M22401-23214-EE
FCC ID: 2BEZORF009VPLUS

1.2 Testing laboratory

1.2.1 Location

10m OATS
No.5-1, Lishui, Shuang Sing Village, Wanli Dist.,
New Taipei City 207, Taiwan (R.O.C.)

3 meter semi-anechoic chamber
No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist.,
Taipei City 114, Taiwan (R.O.C.)
Tel: 886-2-6613-0228

Worldwide Testing Services (Taiwan) Co., Ltd.
6F., No. 58, Ln. 188, Ruiguang Rd., Neihu Dist.,
Taipei City 114 , Taiwan (R.O.C.)
Tel: 886-2-6606-8877

1.2.2 Details of accreditation status

Accredited testing laboratory
FCC filed test laboratory Reg. No.: TW1477, TW1072
Industry Canada filed test laboratory Reg. No.: 20037, 5107A

Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd.

Name:	./.
Accredited no.:	./.
Street:	./.
Town:	./.
Country:	./.

1.3 Details of approval holder

Name:	Sunion Technology Co., Ltd.
Street:	6F., No. 69, Sec. 2, Guangfu Rd., Sanchong Dist.,
Town:	New Taipei City 24158,
Country:	Taiwan (R.O.C.)

1.4 Application details

Date of receipt of test item: January 19, 2024

Date of test: From January 21, 2024 to January 26, 2024

1.5 General information of Test item

Type of test item: RFID Reader

Model number: RF-009V+

Multi-listing model number: ./.

Brand name: Sunion

Maximum output power: 76.27 dBuV/m

Transmitting frequency: 134 kHz

Operation modes: Half-duplex

Modulation type: FM

Antenna type: Coil Antenna

Antenna Gain: 0.5 dBi

Power supply: 12 Vd.c.

Sample no.: #01

Classification:

Fixed Device	☒
Mobile Device (Human Body distance ＞ 20cm)	☐
Portable Device (Human Body distance ＜ 20cm)	☐

Manufacturer: (if applicable)

Name: ./.
Street: ./.
Town: ./.
Country: ./.

1.6 Test standards

447498 D04 Interim General RF Exposure Guidance v01

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

or

The deviations were ascertained in the course of the tests performed. ☐.

2.2 Test environment

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Power supply: 12 Vd.c.

Extreme conditions parameters: ./.

Test item Name	Uncertainty
Estimation Result of Uncertainty of Radiated Emission	Expanded Uncertainty：1.92B

The decision rule is: Measurement uncertainty is not included in the calculation of test results.

2.3 Test Equipment List

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2023/10/19	2024/10/18
ETSTW-RE 176	Loop Antenna	FMZB 1513-60	00039	SCHWARZBECK	2023/8/10	2024/8/9
ETSTW-Cable 020	N TYPE Cable	OATS Cable 1	N30N30-L335-15M	JYE BAO CO.,LTD.	2023/6/26	2024/6/25

3 RF Exposure Test Exemptions

3.1 1-mW Test Exemption

P ≤ 1mW

When the aggregate maximum available power of all transmitting antennas is ≤ 1 mW in the same time-averaging period.

3.2 SAR-Based Exemption

Max. time-averaged power(conducted power) or ERP ≤ Pth

$P_{th}(mW)=ERP_{20cm}(\frac{d}{20})^{x}$ for distance d ≤ 20cm

$P_{th}(mW)=ERP_{20cm}$ for distance 20cm < d ≤ 40cm

$$x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right)$$

$ERP_{20cm}(mW)$ 0.3GHz ≤ f < 1.5GHz: 2040*f
1.5GHz ≤ f ≤ 6GHz: 3060

d: cm
f: GHz

Table B.2 – Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
		5	10	15	20	25	30	35	40	45	50
	300	39	65	88	110	129	148	166	184	201	217
	450	22	44	67	89	112	135	158	180	203	226
	835	9	25	44	66	90	116	145	175	207	240
	1900	3	12	26	44	66	92	122	157	195	236
	2450	3	10	22	38	59	83	111	143	179	219
	3600	2	8	18	32	49	71	96	125	158	195
	5800	1	6	14	25	40	58	80	106	136	169

3.3 MPE-Based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 to support an exemption from further evaluation from 300 kHz through 100 GHz.

>300kHz & distance R > λ/2π ，MPE-based exemption

Table B.1 –Thresholds for single RF sources subject to routine environmental evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz	-	f_H MHz	$\lambda_L / 2\pi$	-	$\lambda_H / 2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	1,920 R^2
1.34	-	30	35.6 m	-	1.6 m	3,450 R^2/f^2
30	-	300	1.6 m	-	159 mm	3.83 R^2
300	-	1,500	159 mm	-	31.8 mm	0.0128 R^2f^2
1,500	-	100,000	31.8 mm	-	0.5 mm	19.2 R^2

f: MHz
R: m
λ/2π
v=f λ
v: speed of light = $3 \times 10^8 m/s$
f: frequency (Hz)
λ: wavelength

f (MHz)	λ / 2π (m)	λ / 2π (mm)
0.125	382	381,972
13.56	3.52	3,521
300	0.159	159
918	0.052	52
2400	0.020	19.9
5250	0.009	9.09
5600	0.009	8.53
5825	0.008	8.20
6000	0.008	7.96
7000	0.007	6.82
10000	0.005	4.77

4 Exemption calculation

1-mW Test Exemption

The maximum power is 76.27 dBuV/m (0.01270 mW)

0.01270 mW ≤ 1mW

The device is qualify for simultaneous transmission SAR exemption.