

RF Exposure Evaluation Declaration

FCC ID: WIYS1U2M4001

Applicant: CASTLES TECHNOLOGY CO., LTD.

Product: POS Terminal

Model No.: S1U2-M4

Trademark:  CASTLES
TECHNOLOGY

FCC Rule Part(s): FCC Part 2.1091

Result: Complies

Received Date: 2025-02-12

Evaluation Date: 2025-03-18

Reviewed By:

Yuri Li

Approved By:

Robin Wu



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
R25S1009034-U401	V01	Initial Report	2025-03-26	Valid

Note: This report is supplement to the FCC ID "WIYS1U2M4001" adding additional bands and related data.

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1. General Information

1.1. Applicant

CASTLES TECHNOLOGY CO., LTD.

6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 231030, TAIWAN (R.O.C.)

1.2. Manufacturer

CASTLES TECHNOLOGY CO., LTD.

6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 231030, TAIWAN (R.O.C.)

1.3. Testing Facility

<input checked="" type="checkbox"/>	<p>Test Site – MRT Suzhou Laboratory</p> <p>Laboratory Location (Suzhou - Wuzhong)</p> <p>D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China</p> <p>Laboratory Location (Suzhou - SIP)</p> <p>4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China</p> <p>Laboratory Location (Suzhou - Wujiang)</p> <p>Building 1, No.1 Xingdong Road, Wujiang, Suzhou, Jiangsu, People's Republic of China</p> <p>Laboratory Accreditations</p> <p>A2LA: 3628.01 CNAS: L10551</p> <p>FCC: CN1166 ISED: CN0001</p> <p>VCCI: <input type="checkbox"/> R-20025 <input type="checkbox"/> G-20034 <input type="checkbox"/> C-20020 <input type="checkbox"/> T-20020 <input type="checkbox"/> R-20141 <input type="checkbox"/> G-20134 <input type="checkbox"/> C-20103 <input type="checkbox"/> T-20104</p>
<input type="checkbox"/>	<p>Test Site – MRT Shenzhen Laboratory</p> <p>Laboratory Location (Shenzhen)</p> <p>1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China</p> <p>Laboratory Accreditations</p> <p>A2LA: 3628.02 CNAS: L10551</p> <p>FCC: CN1284 ISED: CN0105</p>
<input type="checkbox"/>	<p>Test Site – MRT Taiwan Laboratory</p> <p>Laboratory Location (Taiwan)</p> <p>No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)</p> <p>Laboratory Accreditations</p> <p>TAF: 3261</p> <p>FCC: 291082, TW3261 ISED: TW3261</p>

1.4. Product Information

Product	POS Terminal
Model No.	S1U2-M4
Trademark	 CASTLES TECHNOLOGY
NFC Specification	13.56MHz
Wi-Fi Specification	802.11a/b/g/n/ac
Bluetooth Specification	BT5.0
GNSS Specification	GPS, GLONASS, GALILEO, BEIDOU
3GPP Specification	WCDMA Band II/IV/V LTE Band 2/4/5/7/12/13/14/17/25/26/66/38/41
Operating Temperature Range	-20 ~ 70 °C
Supply Voltage Rating	9 ~ 48Vdc, Normal 9Vdc
Antenna Information	Refer to Section 1.5

Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.

1.5. Antenna Details

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
WCDMA Band II	1850 ~ 1910	Monopole Antenna	2.53
WCDMA Band IV	1710 ~ 1755		2.53
WCDMA Band V	824 ~ 849		3.89
LTE Band 2	1850 ~ 1910		2.53
LTE Band 4	1710 ~ 1755		2.53
LTE Band 5	824 ~ 849		3.89
LTE Band 7	2500 ~ 2570		2.20
LTE Band 12	699 ~ 716		3.89
LTE Band 13	777 ~ 787		3.89
LTE Band 14	788 ~ 798		3.89
LTE Band 17	704 ~ 716		3.89
LTE Band 25	1850 ~ 1915		2.53
LTE Band 26	814 ~ 849		3.89
LTE Band 66	1710 ~ 1780		2.53
LTE Band 38	2570 ~ 2620		2.20
LTE Band 41	2496 ~ 2690		2.20

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
2.4GHz Wi-Fi	2412 ~ 2462	PIFA Antenna	2.92
5GHz Wi-Fi	5180 ~ 5825		5.15
Bluetooth	2402 ~ 2480		2.92
NFC	13.56	Loop Antenna	--

Note: The antenna gain is from antenna data sheet provided by the manufacturer.

1.6. Device Classification

According to the user manual, this device is classified as a Mobile Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

1.7. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 2.1091 & KDB 447498 D04 Interim General RF Exposure Guidance v01

2. RF Exposure Evaluation

2.1. Limits

According to FCC §1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500	--	--	f/300	<6
1,500-100,000	--	--	5	<6
(B) Limits for General Population/ Uncontrolled Exposures				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500	--	--	f/1500	<30
1,500-100,000	--	--	1.0	<30

f= frequency in MHz. * = Plane-wave equivalent power density.

2.2. MPE Exemptions

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

(Option A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.

Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

(Option B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

$$P_{th}(mW) = \{ERP_{20cm}(d / 20cm)^x \quad d \leq 20cm$$

$$P_{th}(mW) = \{ERP_{20cm} \quad 20cm < d \leq 40cm$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20cm}\sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20cm}(mW) = \{2040f \quad 0.3GHz \leq f < 1.5GHz$$

$$ERP_{20cm}(mW) = \{3060 \quad 1.5GHz \leq f \leq 6GHz$$

(Option C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to §1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1920R ²
1.34-30	3450R ² /f ²
30-300	3.83R ²
300-1,500	0.0128R ² f
1,500-100,000	19.2R ²

For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P_{th} , including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).

P_{th,i} = the exemption threshold power (P_{th}) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source *i*.

ERP_j = the ERP of fixed, mobile, or portable RF source *j*.

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

Evaluated_k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit_k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from §1.1310 of this chapter.

2.3. Calculated Result

Product	POS Terminal					
Test Item	RF Exposure Evaluation					

Test Mode	Frequency Band (MHz)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (mW)
WCDMA Band II	1850 ~ 1910	25.0	2.53	27.53	25.38	345.14
WCDMA Band IV	1710 ~ 1755	25.0	2.53	27.53	25.38	345.14
WCDMA Band V	824 ~ 849	25.0	3.89	28.89	26.74	472.06
LTE Band 2	1850 ~ 1910	25.0	2.53	27.53	25.38	345.14
LTE Band 4	1710 ~ 1755	25.0	2.53	27.53	25.38	345.14
LTE Band 5	824 ~ 849	25.0	3.89	28.89	26.74	472.06
LTE Band 7	2500 ~ 2570	25.0	2.20	27.20	25.05	319.89
LTE Band 12	699 ~ 716	25.0	3.89	28.89	26.74	472.06
LTE Band 13	777 ~ 787	25.0	3.89	28.89	26.74	472.06
LTE Band 14	788 ~ 798	25.0	3.89	28.89	26.74	472.06
LTE Band 17	704 ~ 716	25.0	3.89	28.89	26.74	472.06
LTE Band 25	1850 ~ 1915	25.0	2.53	27.53	25.38	345.14
LTE Band 26	814 ~ 849	25.0	3.89	28.89	26.74	472.06
LTE Band 66	1710 ~ 1780	25.0	2.53	27.53	25.38	345.14
LTE Band 38	2570 ~ 2620	25.0	2.20	27.20	25.05	319.89
LTE Band 41	2496 ~ 2690	25.0	2.20	27.20	25.05	319.89
2.4GHz Wi-Fi	2412 ~ 2462	19.0	2.92	21.92	19.77	94.84
5GHz Wi-Fi	5180 ~ 5825	16.0	5.15	21.15	19.00	79.43
Bluetooth	2402 ~ 2480	11.0	2.92	13.92	11.77	15.03
NFC	13.56	--	--	-14.00	-16.15	0.02

Notes:

1. Tune-up power was declared by manufacturer.
2. Tune-up EIRP = Tune up Conducted Power + Antenna Gain.
3. Tune-up ERP = Tune-up EIRP - 2.15.

For single RF source, Option A

Test Mode	Frequency Band (MHz)	Tune-up EIRP (mW)	Thresholds EIRP (mW)
NFC	13.56	0.04	1

For single RF source, Option B

Test Mode	Frequency Band (MHz)	R (m)	Tune-up ERP (mW)	Thresholds ERP (mW)
WCDMA Band II	1850 ~ 1910	0.20	345.14	3060.00
WCDMA Band IV	1710 ~ 1755	0.20	345.14	3060.00
WCDMA Band V	824 ~ 849	0.20	472.06	1680.96
LTE Band 2	1850 ~ 1910	0.20	345.14	3060.00
LTE Band 4	1710 ~ 1755	0.20	345.14	3060.00
LTE Band 5	824 ~ 849	0.20	472.06	1680.96
LTE Band 7	2500 ~ 2570	0.20	319.89	3060.00
LTE Band 12	699 ~ 716	0.20	472.06	1425.96
LTE Band 13	777 ~ 787	0.20	472.06	1585.08
LTE Band 14	788 ~ 798	0.20	472.06	1607.52
LTE Band 17	704 ~ 716	0.20	472.06	1436.16
LTE Band 25	1850 ~ 1915	0.20	345.14	3060.00
LTE Band 26	814 ~ 849	0.20	472.06	1660.56
LTE Band 66	1710 ~ 1780	0.20	345.14	3060.00
LTE Band 38	2570 ~ 2620	0.20	319.89	3060.00
LTE Band 41	2496 ~ 2690	0.20	319.89	3060.00
2.4GHz Wi-Fi	2412 ~ 2462	0.20	94.84	3060.00
5GHz Wi-Fi	5180 ~ 5825	0.20	79.43	3060.00
Bluetooth	2402 ~ 2480	0.20	15.03	3060.00

Notes:

1. R is from user manual.
2. The EUT supports WCDMA/LTE + Wi-Fi/BLE simultaneous transmissions, therefore, the worst-case total exposure ratios = $472.06/1425.96 + 94.84/3060 = 0.36 < 1$.

Conclusion:

The device qualifies for RF exposure test exemption at 20cm distance.