FCC RF Exposure Report

Report No.:	MFBBGM-WTW-P23070647
FCC ID:	WIYS1P001
Test Model:	S1P
Received Date:	2023/7/26
Date of Evaluation:	2023/9/21
Issued Date:	2023/9/22
Applicant:	CASTLES TECHNOLOGY CO., LTD.
Address:	6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 23143, TAIWAN (R. O. C.)
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
MFBBGM-WTW-P23070647	Original Release	2023/9/22

1 Certificate of Conformity

Product: POS Terminal

Brand: CASTLES TECHNOLOGY

Test Model: S1P

Sample Status: Identical Prototype

Applicant: CASTLES TECHNOLOGY CO., LTD.

Date of Evaluation: 2023/9/21

FCC Rule Part: FCC Part 2 (Section 2.1091)

Standards: KDB 447498 D01 General RF Exposure Guidance v06

We, **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, declare that the equipment above has been found compliance with the requirement limits of applicable standards. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate under the standards herein specified.

Prepared by : _Gina Liu_ , **Date:** 2023/9/22

Gina Liu / Specialist

Approved by : _Jeremy Lin_ , **Date:** 2023/9/22

Jeremy Lin / Project Engineer

2 RF Exposure

2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
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
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

f = Frequency in MHz; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$
where
Pd = power density in mW/cm²
Pout = output power to antenna in mW
G = gain of antenna in linear scale
pi = 3.1416
r = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

3 Calculation Result of Maximum Conducted Power

EUT contains certified module (FCC ID: WIYSLM500QA)

Mode	Tune-up Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WLAN 2.4GHz	18.0	0.75	20	0.015	1.00
WLAN 5.18 ~ 5.24GHz	14.0	2.69	20	0.009	1.00
WLAN 5.745 ~ 5.825GHz	14.5	2.69	20	0.010	1.00
Bluetooth	11.5	0.75	20	0.003	1.00

Mode	Tune-up Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
GSM850	31.5	-1.18	20	0.214	0.550
PCS1900	28	1.25	20	0.167	1.000
WCDMA 2	20.5	1.25	20	0.030	1.000
WCDMA 4	21.5	1.25	20	0.037	1.000
WCDMA 5	23	-1.18	20	0.030	0.550
LTE Band 2	21	1.25	20	0.033	1.000
LTE Band 4	22	1.25	20	0.042	1.000
LTE Band 5	23	-1.18	20	0.030	0.550
LTE Band 7	21	1.25	20	0.033	1.000
LTE Band 12	22.5	-1.18	20	0.027	0.466
LTE Band 13	23.5	-1.18	20	0.034	0.520
LTE Band 17	23	-1.18	20	0.030	0.469
LTE Band 25	21.5	1.25	20	0.037	1.000
LTE Band 26 (Part 22)	23	-1.18	20	0.030	0.550
LTE Band 26 (Part 90)	23	-1.18	20	0.030	0.543
LTE Band 66	22.5	1.25	20	0.047	1.000

Mode	Field Strength (dBuV/m) @30m	Field Strength (dBuV/m) @3m	Max. Power EIRP (dBm)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
NFC	46.4	86.4	-8.83	20	0.00003	0.978

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. Max Power (dBm) = Field Strength of Fundamental (dBuV/m@3m) − 95.23,
   Max Power (mW) = $10^{(\text{Max power (dBm)}/10)}$
3. The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

4. The antenna information for host is listed as below:

WLAN Antenna				
Brand	Antenna Type	Connector	Antenna Gain (dBi)	
			2400~2483.5 MHz	5150-5850 MHz
ARISTOTLE	PIFA	ipex(MHF)	0.75	2.69

Antenna Type		Monopole	
Antenna Connector		N/A	
Item	Band	Gain (dBi)	
		Main Ant. 1	Aux. Ant. 2
LTE	Band 2	1.25	1.20
	Band 4	1.25	1.20
	Band 5	-1.18	-3.01
	Band 7	1.25	1.20
	Band 12	-1.18	-3.01
	Band 13	-1.18	-3.01
	Band 17	-1.18	-3.01
	Band 25	1.25	1.20
	Band 26	-1.18	-3.01
	Band 66	1.25	1.20
WCDMA	Band 2	1.25	1.20
	Band 4	1.25	1.20
	Band 5	-1.18	-3.01
GSM	850	-1.18	-3.01
	1900	1.25	1.20

NFC Antenna		
Type	Connector	Gain (dBi)
Loop	NA	-

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

Conclusion:

Below function can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

1. WLAN 2.4GHz + WWAN + NFC = 0.015 / 1 + 0.214 / 0.55 + 0.00003 / 0.978 = 0.404
2. WLAN 5GHz + WWAN + NFC = 0.010 / 1 + 0.214 / 0.55 + 0.00003 / 0.978 = 0.399
3. Bluetooth + WWAN + NFC = 0.003 / 1 + 0.214 / 0.55 + 0.00003 / 0.978 = 0.392

Therefore, the maximum calculations of above situations are less than the "1" limit.

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