

## RF EXPOSURE REPORT



**Applicant:** CASTLES TECHNOLOGY CO., LTD.  
6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT,  
NEW TAIPEI CITY 23143, TAIWAN (R.O.C)

**Manufacturer:** CASTLES TECHNOLOGY CO., LTD.  
6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT,  
NEW TAIPEI CITY 23143, TAIWAN (R.O.C)

**Product Name:** Smart module

**Brand Name:**  CASTLES  
TECHNOLOGY

**Model No.:** SLM500

**Model Difference:** N/A

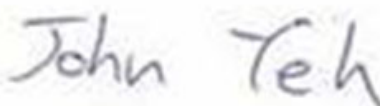
**Report Number:** TESA2210000405ES

**FCC ID** WIYSLM500QA

**Issue Date:** December 16, 2022

**Date of EUT Received:** October 20, 2022

Approved By



John Yeh

**We hereby certify that:**

The above equipment was evaluate by SGS Taiwan Ltd. Central RF Lab. The evaluation in this report is in compliance with FCC Rule Part §1.1307.

The results of this report relate to the specific sample identified in this report.

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TESA2210000405ES	00	Original.	December 08, 2022	Susan Lin	
TESA2210000405ES	01	Add section 1.3	December 16, 2022	Susan Lin	*

**Note:**

- The remark "\*" indicates modification of the report upon requests from certification body.

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## 1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

### 1.1 Product Description

Product Name:	Smart module
Brand Name:	
Model No.:	SLM500
Model Difference:	N/A
Hardware Version:	V1.00
Firmware Version:	N/A
EUT Series No.:	573223200140
Product Name of Host:	POS Terminal
Brand Name of Host:	
Model No. of Host:	S1U2
Power Supply:	9Vdc from Adapter

### 1.2 Evaluation site

Laboratory	Site Address	FCC Designation number	ISED Company Number	CAB Identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	<input type="checkbox"/> No. 134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, 24803, Taiwan.	TW0027	4620A	TW3702
	<input checked="" type="checkbox"/> No. 2, Keji 1st Rd., Guishan Township, Taoyuan County, 333 Taiwan.	TW0028	4620E	
	<input type="checkbox"/> 1F, No. 8, Alley 15, Lane 120, Sec. 1, Nei Hu Road, Nei Hu District, Taipei City, 222 Taiwan.	TW0029	23862	

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1.3 PG information

Operating Frequency (MHz)				Module	Max. Output Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	ERP (W)	separation distance(m)	ERPth (W)	ERP/ERPth	FCC Worst Case	
GSM / GPRS / EDGE 850	824	~	849	SLM500	24.97	1.71	24.53	0.28	0.2	0.42	0.67		
GSM / GPRS / EDGE 1900	1850	~	1910		22.99	3.41	26.40	0.44	0.2	1.00	0.44		
WCDMA / HSPA Band II	1850	~	1910		24.00	3.41	27.41	0.55	0.2	1.00	0.55		
WCDMA / HSPA Band IV	1710	~	1753		24.50	3.41	27.91	0.62	0.2	1.00	0.62		
WCDMA / HSPA Band V	824	~	849		24.50	1.71	26.21	0.42	0.2	0.55	0.76		
LTE-Band 2	1850	~	1910		24.00	3.41	27.41	0.55	0.2	1.00	0.55		
LTE-Band 4	1710	~	1755		24.00	3.41	27.41	0.55	0.2	1.00	0.55		
LTE-Band 5	824	~	849		24.50	1.71	26.21	0.42	0.2	0.55	0.76		
LTE-Band 7	2500	~	2570		23.00	1.72	24.72	0.30	0.2	1.00	0.30		
LTE-Band 12	699	~	716		24.50	1.71	26.21	0.42	0.2	0.47	0.89	V	
LTE-Band 13	777	~	787		24.50	1.71	26.21	0.42	0.2	0.52	0.81		
LTE-Band 17	704	~	716		24.50	1.71	26.21	0.42	0.2	0.47	0.89	V	
LTE-Band 25	1850	~	1915		24.00	3.41	27.41	0.55	0.2	1.00	0.55		
LTE-Band 26	824	~	849		24.50	1.71	26.21	0.42	0.2	0.55	0.76		
LTE-Band 26 Part 90	814	~	824		24.50	1.71	26.21	0.42	0.2	0.54	0.78		
LTE-Band 66	1710	~	1780		24.00	3.41	27.41	0.55	0.2	1.00	0.55		

Note:

Time slot average factor is as follows:

- 1 Tx slot = 9.03 dB, Frame-Average output power = Burst-Average output power – 9.03 dB
- 2 Tx slot = 6.02 dB, Frame-Average output power = Burst-Average output power – 6.02 dB
- 3 Tx slot = 4.26 dB, Frame-Average output power = Burst-Average output power – 4.26 dB
- 4 Tx slot = 3.01 dB, Frame-Average output power = Burst-Average output power – 3.01 dB

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## 2 DETERMINATION OF MPE EXEMPTION

### 2.1 FCC

#### 2.1.1 Single RF Source

As per §1.1307(b)(3)(i),

- (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 (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);
- (B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (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).  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

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

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

**Note:** when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

- (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  $\lambda$  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).

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

RF Source frequency (MHz)			Minimum Distance			Threshold ERP (W)
fL		fH	$\lambda L / 2\pi$		$\lambda H / 2\pi$	
0.3	-	1.34	159m	-	35.6m	1920 R <sup>2</sup>
1.34	-	30	35.6m	-	1.6m	3450 R <sup>2</sup> /f <sup>2</sup>
30	-	300	1.6m	-	159mm	3.83 R <sup>2</sup>
300	-	1500	159mm	-	31.8mm	0.0128 R <sup>2</sup> f
1500	-	100000	31.8mm	-	0.5mm	19.2R <sup>2</sup>

R= minimum separation distance in meter

f = frequency in MHz

### 2.1.2 Multiple RF Sources

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.

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

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### 2.1.3 Single RF Source Evaluation Results

Chain 0	Frequency (MHz)	Max. tune-up power (dBm)	Peak gain (dBi)	ERP (dBm)	ERP (W)	Permissible Minimum separation distance ( $\lambda/2\pi$ ) (m)	R = actual Minimum separation distance(m)	ERP <sub>th</sub> (W)	ERP/ERP <sub>th</sub>	Simultaneous transmission modes		
										1	2	3
WWAN	716	24.5	1.71	24.06	0.255	0.0667	0.200	0.367	0.695	V	V	V

Chain 1	Frequency (MHz)	Max. tune-up power (dBm)	Peak gain (dBi)	ERP (dBm)	ERP (W)	Permissible Minimum separation distance ( $\lambda/2\pi$ ) (m)	R = actual Minimum separation distance(m)	ERP <sub>th</sub> (W)	ERP/ERP <sub>th</sub>	Simultaneous transmission modes		
										1	2	3
WiFi 2.4GHz	2412	18	2.01	17.86	0.061	0.0198	0.200	0.768	0.079	V		
Bluetooth	2402	12	2.01	11.86	0.015	0.0199	0.200	0.768	0.020		V	
WiFi 5GHz	5180	14	1.99	13.84	0.024	0.0092	0.200	0.768	0.031			V

**Note:** For conservativeness, the lowest uplink frequency of each band is used to determine the minimum separation distance of that band. All the single RF source results (P or ERP) are less than their corresponding threshold (P<sub>th</sub> or ERP<sub>th</sub>), so they are exempt from RF exposure testing.

### 2.2 Multiple RF Sources Evaluation Results

Simultaneous transmission modes	$\Sigma$ ERP/ERP <sub>th</sub>	Criteria
1	0.774	1
2	0.715	1
3	0.726	1

**Note:**

1.  $\Sigma$ (ERP/ERP<sub>th</sub>): This is a summation of [(ERP of RF source / exemption threshold ERP for RF source)].  
Considering the collocated transmitters, the aggregated (ERP/ERP<sub>th</sub>) is smaller than 1, and MPE of collocated transmitters is compliant

~ End of Report ~

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