RF Exposure Evaluation Declaration

FCC ID:	2AUBBHSA-MAC
Applicant:	China StarWin Science & Technology Co., Ltd
Product:	Phased Array Satellite Communication Terminal
Model No.:	KaWin
Serial Model No.:	HSA-MAC, HT-ESA, ESA-MAC, HSA-PAC, HSA-FAC, ESA-IOT-Ka
Brand Name:	StarWin
FCC Classification:	Digital Transmission System (DTS) Licensed Non-Broadcast Station Transmitter (TNB)
FCC Rule Part(s):	FCC Part 2.1091
Result:	Complies
Evaluation Date:	2024-01-11

Reviewed By: Jame Yuan

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

Revision History

Report No.	Version	Description	Issue Date	Note
2302RSU008-U4	V01	Initial Report	2024-02-28	Valid

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1. General Information

1.1. Applicant

China StarWin Science & Technology Co.,Ltd

Floor 3th, Building B, No. 2 Keyuannan 2nd Road, High-tech Zone, Chengdu, China

1.2. Manufacturer

China StarWin Science & Technology Co.,Ltd

Floor 3th, Building B, No. 2 Keyuannan 2nd Road, High-tech Zone, Chengdu, China

1.3. Testing Facility

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

1.4. Product Information

Product Name	Phased Array Satellite Communication Terminal
Model No.	KaWin
Serial Model No.:	HSA-MAC, HT-ESA, ESA-MAC, HSA-PAC, HSA-FAC, ESA-IOT-Ka
Wi-Fi Specification	802.11b/g/n
Satellite Specification	Transmit: 29.25~30.00GHz Receive: 18.3~18.8GHz, 19.7 ~ 20.2GHz
GNSS Specification	GPS, BDS
Hardware Version	HSA-MAC, HT-ESA,HSA-PAC, HSA-FAC, ESA-IOT-Ka: ACU-2.0,ESA-DRV-V1.0, ZL60P-DRV-V5.1 ESA-MAC: ACU-2.0, ESA-DRV-V1.0
Software Version	KA_1.12B
Antenna Information	Refer to section 1.5
Power Type	By Adapter
Operating Temperature	-40 ~ 70 °C
Accessories	
Adapter	Model: HEP-480-36A Input: 100-240V ~ 50/60Hz 2.0A Output: 36V=13.3A Rated Power: 478.8W
Note: 1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. 2. The differences between the models are the usage scenario, scanning mode and the bracket, which do not affect the RF.	

1.5. Antenna Details

Antenna Type	Frequency Band (MHz)	Antenna Gain (dBi)
PCB Antenna	2412 ~ 2462	4.0
Phased-array Antenna	29250 ~ 30000	37.7dBi (in range of ±15 degree) 10.0dBi (out range of ±15 degree)

1.6. Device Classification

According to the user manual, the antenna of this device is at least 185cm(For out range of ±5 degrees on-axis) and 3100cm(For ±5 degrees on-axis) away from the body of the user, 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. Test 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:

$P\,th(mW) = \{ERP_{20cm}(d / 20cm)^{x}$ d ≤ 20cm

$P\,th(mW) = \{ERP_{20cm}$ 20cm < d ≤ 40cm

Where

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

and

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

$ERP_{20cm}(mW) = \{3060$ 1.5GHz ≤ f ≤ 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 λ/2π, 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 λ/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	$0.0128R^2f$
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 is 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.

$\boldsymbol{P_i}$ = 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).

$\boldsymbol{P_{th,i}}$ = 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*.

$\boldsymbol{ERP_j}$ = 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 λ/2π 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. Test Result

Product	Phased Array Satellite Communication Terminal
Test Item	RF Exposure Evaluation

For single RF source, Option C

For ±15 degrees on-axis:

Antenna Gain: Refer to clause 1.5.

Test Mode	Frequency Band (MHz)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune up EIRP (dBm)
802.11b/g/n/	2412 ~ 2462	16.61	4.00	20.61
Satellite	29250 ~ 30000	--	--	78.71

Note: Tune-up power was declared by manufacturer.

Test Mode	λ / 2 π (m)	R (m)	Tune-up ERP (dBm)	Tune-up ERP (W)	Threshold ERP (W)
802.11b/g/n/	0.0198	49	18.46	0.07	46099.2
Satellite	0.0016	49	76.56	45289.76	46099.2

Note: R is from user manual.

Note:

WLAN 2.4GHz Band and Satellite can transmit simultaneously.

The Max Simultaneous Transmission = 0.07/46099.2 + 45289.76/46099.2 = 0.982 < 1

Therefore, the safety Distance is 49 m (for ±15 degrees on-axis).

For out range of ±15 degrees on-axis:

Test Mode	Frequency Band (MHz)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune up EIRP (dBm)
802.11b/g/n/	2412 ~ 2462	16.61	4.00	20.61
Satellite	29250 ~ 30000	--	--	51.01 Note 2

Note 1: Tune-up power was declared by manufacturer.

Note 2: The level is calculated by the difference of the antenna gain according to the section 1.5.

Test Mode	λ / 2 π (m)	R (m)	Tune-up ERP (dBm)	Tune-up ERP (W)	Threshold ERP (W)
802.11b/g/n/	0.0198	2.1	18.46	0.07	84.67
Satellite	0.0016	2.1	48.86	76.91	84.67

Note: R is from user manual.

Note:

WLAN 2.4GHz Band and Satellite can transmit simultaneously.

The Max Simultaneous Transmission = 0.07/84.67 + 76.91/84.67 = 0.909 < 1

Therefore, the safety Distance is 2.1 m (for out of range ±15 degrees on-axis).

The End