RF Exposure Evaluation Report

FCC 47 CFR § 2.1091

for

77G Side Radar

Model Name.: ARS-DA03

Prepared for:

Alpha Networks Inc.
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Hsinchu 300094, Taiwan

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	October 04, 2024	Initial Issue	ALL	Allison Chen
01	December 09, 2024	See the following Note Rev.(01)	ALL	Allison Chen
02	December 25, 2024	See the following Note Rev.(02)	P.7, 12, 13	Allison Chen
03	December 30, 2024	See the following Note Rev.(03)	P.7, 12, 13	Allison Chen
04	December 31, 2024	See the following Note Rev.(03)	P.7, 12	Allison Chen

Note:
Rev.(01)
1. Modify antenna specification, frequency range in section 3.2 and test data in section 5 and 6.1.
Rev.(02)
1. Modify antenna specification, max. tune-up power (dBm) in section 3.2 and test data in section 5 and 6.1.
Rev.(03)
1. Modify antenna specification, max. tune-up power (dBm) in section 3.2 and test data in section 5 and 6.1.
Rev.(04)
1. Modify antenna specification, max. tune-up power (dBm) in section 3.2 and test data in section 5.

Table of Contents

1 Attestation of Test Results

Applicant Name	Alpha Networks Inc.
Model Name	ARS-DA03
Applicable Standards	FCC 47 CFR § 2.1091 FCC 47 CFR § 1.1307 FCC 47 CFR § 1.1310 Published RF exposure KDB procedures
Receive EUT Date:	June 13, 2024
Compliance Certification Services Inc. , tested the above equipment in accordance with the requirements set forth in the above standards. Determination of compliance is based on the results of the compliance measurement,not taking into account measurement instrumentation uncertainy.All indications of Pass/Fail in this report are opinions expressed by Compliance Certification Services Inc, based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.	
Approved & Released By: 	
Sky Zhou Asst. Section Manager Compliance Certification Services Inc.	

2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1091, the following FCC Published RF exposure KDB procedures:

- 447498 D04 Interim General RF Exposure Guidance v01
- 865664 D02 RF Exposure Reporting v01r02

3 Device Under Test (DUT) Information

3.1 DUT Description

Product	77G Side Radar
Trade Name	ALPHA
Model No.	ARS-DA03
Model Discrepancy	N/A
Hardware Version	ARS-SA01B: 2A4G, ARS-SA07: 1A1G
Software Version	0000001620.56202
Sample Stage	Identical prototype

3.2 Wireless Technologies

Frequency Range	☐ Bluetooth: 2402MHz-2480MHz ☐ 802.11b/g/n HT20: 2412MHz ~ 2462 MHz ☐ 802.11n HT40: 2422MHz ~ 2452 MHz ☐ 802.11a/n HT20: 5180MHz ~ 5240MHz / 5260 ~ 5320MHz / 5500 ~ 5700MHz / 5745MHz ~ 5825MHz ☐ 802.11n HT40: 5190 MHz ~ 5230 MHz / 5270 MHz ~ 5310 MHz / 5510 MHz ~ 5670 MHz / 5755 MHz ~ 5795MHz ☐ 802.11ac VHT20: 5180MHz ~ 5240MHz / 5260 ~ 5320MHz / 5500 ~ 5700MHz / 5745MHz ~ 5825MHz ☐ 802.11ac VHT40: 5190 MHz ~ 5230 MHz / 5270 MHz ~ 5310 MHz / 5510 MHz ~ 5670 MHz / 5755 MHz ~ 5795MHz ☐ 802.11ac VHT80: 5210 MHz / 5290 MHz / 5530 MHz / 5775 MHz ☐ 802.11ax HE20: 5180MHz ~ 5240MHz / 5260 ~ 5320MHz / 5500 ~ 5700MHz / 5745MHz ~ 5825MHz ☐ 802.11ax HE40: 5190 MHz ~ 5230 MHz / 5270 MHz ~ 5310 MHz / 5510 MHz ~ 5670 MHz / 5755 MHz ~ 5795MHz ☐ 802.11ax HE80: 5210 MHz / 5290 MHz / 5530 MHz / 5775 MHz ☒ Others: 76.5-76.74 GHz
Exposure classification	☐ Occupational/Controlled exposure ☒ General Population/Uncontrolled exposure
Antenna Specification	**Type: Patch Antenna** (1) Antenna model: ARS-SA01B/TX1, Gain: 18.69 dBi ARS-SA01B/TX2, Gain: 17.75 dBi (2) Antenna model: ARS-SA07/TX5, Gain: 11.09 dBi ARS-SA07/TX6, Gain: 11.94 dBi
Max. Tune-up Power (dBm)	Antenna model ARS-SA01B: -10.00 dBm (0.100 mW) Antenna model ARS-SA07: -5.50 dBm (0.282 mW)

Notes:

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. The EIRP power referred the power of the test report TMWK2406001942KR for RF Exposure assessment purpose.

4 Maximum Permissible Exposure

4.1 Limits for Maximum Permissible Exposure (MPE)

Table 1 - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
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 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
300-1,500			f/1500	30
1,500-100,000			1.0	30

4.2 MPE Calculation Method

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ **Equation 1**

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

If, Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

4.3 MPE EXEMPTION

(A) The available maximum time-averaged power is no more than 1 mW

(B) The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold *Pth* (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). *Pth* is given by:

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

Where

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

and

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

d = the separation distance (cm);

(C) 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).

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	**Threshold ERP (watts)**
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.
Note: R is in meters, f is in MHz.	

4.4 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),

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

5 MPE Exemption Option C

(1) Antenna model: ARS SA01B

Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
76500	0.2	-10	18.69	8.69	6.54	0.005	0.768	Complies

(2) Antenna model: ARS-SA07

Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
76500	0.2	-5.5	11.94	6.44	4.29	0.003	0.768	Complies

6 Simultaneous Transmission Analysis

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),

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

RF Exposure Condition	Item	Capable Transmit Configurations		
	1	Antenna (ARS SA01B)	+	Antenna (ARS SA07)

6.1 Sum of the 77G Side Radar

(1) Antenna model: ARS SA01B + ARS SA07

Antenna	Frequency (MHz)	Max Tune-up ERP(mW)	ERP Threshold(mW)	simultaneous Transmission	simultaneous Transmission Limit
ARS SA01B	76500	0.005	0.768	0.01	≤1
ARS SA07	76500	0.003	0.768		

7 Facilities

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

END OF REPORT