



SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

SZEMC-TRF-01 Rev. A/1

Report No.: SZCR230700233115

Page: 1 of 14

RF EXPOSURE EVALUATION REPORT

Application No.: SZCR2307002331AT
Applicant: Icomera AB
Address of Applicant: Odinsgatan 28, Gothenburg, SE-411 03, Sweden
Manufacturer: Icomera AB
Address of Manufacturer: Odinsgatan 28, Gothenburg, SE-411 03, Sweden
Factory: Thundercomm Technology Co., Ltd
Address of Factory: No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

Equipment Under Test (EUT):

Type of Equipment/EUT name: Access Point
Model Name: A2-e
Type Number: CDE000832-1, CDE000832-2
Brand Name: ICOMERA
HW Version: R1
SW Version: IWP5
FCC ID: 2AAC2-A2E
Standard(s) : FCC Rules 47 CFR §2.1091
KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt: 2024-04-19
Date of Evaluation: 2024-04-20 to 2024-10-23
Date of Issue: 2024-10-24

Evaluation Result:	Pass*
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* In the configuration evaluated, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch EMC Laboratory

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SZEMC-TRF-01 Rev. A/1

Report No.: SZCR230700233115

Page: 2 of 14

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2024-10-24		Original

Authorized for issue by:				
		Calvin Weng		
		Calvin Weng/Project Engineer		
		Eric Fu		
		Eric Fu/Reviewer		

2 Contents

	Page
1 Cover Page	1
2 Contents	3
3 General Information	4
3.1 General Description of E.U.T.	4
3.2 Details of E.U.T.	4
3.3 Separation Distance	6
3.4 Test Location	7
3.5 Test Facility	7
3.6 Deviation from Standards	7
3.7 Abnormalities from Standard Conditions	7
4 FCC Radiofrequency radiation exposure limits	8
4.1 Blanket 1 mW Blanket Exemption	8
4.2 MPE-based Exemption	8
4.3 SAR-based Exemption	9
5 RF Exposure Evaluation	13
6 EUT Constructional Details (EUT Photos)	14



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3 General Information

3.1 General Description of E.U.T.

Product Type:	<input type="checkbox"/> Portable device
	<input checked="" type="checkbox"/> Mobile device
	<input type="checkbox"/> Fixed device

3.2 Details of E.U.T.

Product brief description:	Wireless Access Point, works as a mobile, high performance Wireless Access Point, foremost intended for rail
Power supply:	DC24V/110V, 3A Or PoE input: DC37-57V, 1.7A
Blockchain Verified QR Code:	
Type of Equipment/ EUT name:	Access Point
Model Name:	A2-e
Type Number:	CDE000832-1, CDE000832-2
Brand Name:	ICOMERA
HW Version:	R1
SW Version:	IWP5
For 2.4G Wi-Fi:	
Operation Frequency:	802.11b/g/n(HT20)/ax(HEW20): 2412MHz to 2462MHz 802.11n(HT40)/ax(HEW40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11ax: OFDMA (1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20)/ax(HEW20): 11 802.11n(HT40)/ax(HEW40): 7
Channel Spacing:	5MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	Ant1: 3.69dBi, Ant2: 3.51Bi, Ant3: 3.41dBi, Ant4: 3.58dBi
For 5G Wi-Fi:	
Operation Frequency/Number of channels (20MHz):	U-NII-1: 5180-5240MHz (4 Channels) U-NII-2A: 5260-5320MHz (4 Channels) U-NII-2C: 5500-5700MHz (11 Channels)



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SZEMC-TRF-01 Rev. A/1

Report No.: SZCR230700233115

Page: 5 of 14

	U-NII-3: 5745-5825MHz (5 Channels)
Operation Frequency/Number of channels/(40MHz):	U-NII-1: 5190-5230MHz (2 Channels) U-NII-2A: 5270-5310MHz (2 Channels) U-NII-2C: 5510-5670MHz (5 Channels) U-NII-3: 5755-5795MHz (2 Channels)
Operation Frequency/Number of channels (80MHz):	U-NII-1: 5210MHz (1 Channel) U-NII-2A: 5290MHz (1 Channel) U-NII-2C: 5530-5610MHz (2 Channels) U-NII-3: 5775MHz (1 Channel)
Operation Frequency / Number of channels (160MHz):	U-NII-1/2A: 5250MHz (1 Channel); U-NII-2C: 5570MHz (1 Channel)
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
Channel Spacing:	802.11a/n/ac/ax/be 20: 20MHz 802.11n/ac/ax/be 40: 40MHz 802.11ac/ax/be 80: 80MHz 802.11ax/be 160: 320MHz
DFS Function:	Master
TPC Function:	support
Antenna Type:	Dipole Antenna
Antenna Gain:	U-NII-1: Ant1: 4.29dBi, Ant2: 3.83dBi, Ant3: 4.10dBi, Ant4: 4.20dBi U-NII-2A: Ant1: 4.49dBi, Ant2: 4.41dBi, Ant3: 4.43dBi, Ant4: 4.24dBi U-NII-2C: Ant1: 4.28dBi, Ant2: 3.94dBi, Ant3: 4.17dBi, Ant4: 4.25dBi U-NII-3: Ant1: 4.25dBi, Ant2: 3.63dBi, Ant3: 3.93dBi, Ant4: 3.62dBi
For 6G Wi-Fi	
Operation Frequency:	IEEE 802.11 ax/be(20/40/80/160/320): 5925 MHz ~ 6425 MHz IEEE 802.11 ax/be(20/40/80/160): 6525 MHz ~ 6875 MHz
Number of channels:	20MHz bandwidth: 41 40MHz bandwidth: 20 80MHz bandwidth: 10 160MHz bandwidth: 4 320MHz bandwidth: 2
Modulation Type:	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM,



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	1024QAM,4096QAM)
Channel Spacing:	802.11ax/be 20: 20MHz 802.11ax/be 40: 40MHz 802.11ax/be 80: 80MHz 802.11ax/be 160: 160MHz 802.11be 320: 320MHz
DFS Function:	Master
Antenna Type:	Dipole Antenna
Antenna Gain:	U-NII-5: Ant1: 4.53dBi, Ant2: 4.70dBi, Ant3: 4.18dBi, Ant4: 4.50dBi U-NII-7: Ant1: 4.09dBi, Ant2: 5.12dBi, Ant3: 4.33dBi, Ant4: 5.08dBi

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

Remark:

Model No.: A2-e.

There are two versions of A2-e. Type number CDE000832-1 with PoE and CDE000832-2 with Bypass relays.

Only Type Number CDE000832-1 was tested in this report, since the electrical circuit design, layout, internal wiring and components used were similar.

The difference being that CDE000832-1 can be powered by both PoE and DC power, whereas CDE000832-2 can only be powered by DC.

3.3 Separation Distance

Minimum test separation distance:	30cm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.	

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SZEMC-TRF-01 Rev. A/1

Report No.: SZCR230700233115

Page: 7 of 14

3.4 Test Location

All tests were performed at:

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Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

3.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd.

Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

3.6 Deviation from Standards

None

3.7 Abnormalities from Standard Conditions

None



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4 FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

4.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	—	1.34	159 m	—	35.6 m	1,920 R ²
1.34	—	30	35.6 m	—	1.6 m	3,450 R ² /f ²
30	—	300	1.6 m	—	159 mm	3.83 R ²
300	—	1,500	159 mm	—	31.8 mm	0.0128 R ² f
1,500	—	100,000	31.8 mm	—	0.5 mm	19.2R ²
Subscripts L and H are low and high; λ is wavelength.						
From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are

based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than $ERP_{20\text{cm}}$ in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{\text{th}} (\text{mW}) = ERP_{20\text{cm}} (\text{mW}) = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only 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.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

Limit calculation			
Frequency range	Frequency(MHz)	$R(\lambda/2\pi)(\text{m})$	Threshold ERP(W)
300~1500MHz	915	0.0522	0.032
1500~100000MHz	2480	0.0193	0.007

4.3 SAR-based Exemption

1.SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.



The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

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

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).

Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance(mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	Distance(cm)	Pth (mW)
0.3~1.5	0.915	1.474	0.5	8.133
1.5~6	2.48	1.905	0.5	2.717

2. According to FCC Part1.1310: 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 part1.1307(b)

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 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
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	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
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.



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5 RF Exposure Evaluation

Test Mode	Frequency (MHz)	Maximum EIRP [dBm]	Power Density (mW/cm ²)	Limit (mW/cm ²)	Ratio	Verdict
2.4G Wi-Fi	2462	32.88	0.1716	1.000	0.1716	Pass
5G Wi-Fi	5785	34	0.2221	1.000	0.2221	Pass
6G Wi-Fi	6265	13.37	0.0012	1.000	0.0012	Pass

Simultaneous transmission

Test Mode	2.4G Wi-Fi	5G Wi-Fi	6G Wi-Fi	Total Ratio	Limit	Verdict
Ratio	0.1716	0.2221	0.0012	0.3949	1.0	Pass

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

6 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for SZCR2307002331AT.

--End of the Report--



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