TEST REPORT

Applicant:	Volansys Technologies Pvt Ltd
Address:	Block A-7th Floor, Safal Profitaire, Corporate Road, Prahaladnagar, Ahmedabad-380015, Gujarat, India
Equipment Type:	CENTAURI 200 Automotive/Telematics IoT Gateway
Model Name:	CT200-AT
Brand Name:	Volansys
FCC ID:	2AKNO-CT200-AT
Test Standard:	47 CFR Part 2.1091 KDB 447498 D04 v01
Sample Arrival Date:	Feb. 21, 2023
Test Date:	Feb. 22, 2023 – Mar. 22, 2023
Date of Issue:	Aug. 18, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Lining **Checked by:** Xu Rui **Approved by:** Tolan Tu

(Testing Director)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Apr. 13, 2023	Initial Issue
Rev. 02	Aug. 18, 2023	Updated Assessment Result in Section 5

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Volansys Technologies Pvt Ltd
Address	Block A-7th Floor, Safal Profitaire, Corporate Road, Prahaladnagar, Ahmedabad-380015, Gujarat, India

2.2 Manufacturer Information

Manufacturer	Volansys Technologies Pvt Ltd
Address	Ratana Business Hub, 207, 2nd Floor, Opp Bharat Petrol Pump, Sanathal Chokdi, Changodar Highway, Ahmedabad 382210 Gujarat India

2.3 Factory Information

Factory	Volansys Technologies Pvt Ltd
Address	Ratana Business Hub, 207, 2nd Floor, Opp Bharat Petrol Pump, Sanathal Chokdi, Changodar Highway, Ahmedabad 382210 Gujarat India

2.4 General Description for Equipment under Test (EUT)

EUT Name	CENTAURI 200 Automotive/Telematics IoT Gateway
Model Name Under Test	CT200-AT
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	1.1
Software Version	1.0.0
Dimensions (Approx.)	180 (L) x 100 (W) x 32 (H) mm
Weight (Approx.)	245g

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	3G Network WCDMA/HSDPA/HSUPA Band 2/4/5 4G Network FDD LTE Band 2/4/5/12/13 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20) GPS, GLONASS

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	WCDMA; LTE; WLAN		
Frequency Range	WCDMA Band 2	TX: 1850 MHz ~ 1910 MHz	RX: 1930 MHz ~ 1990 MHz
	WCDMA Band 4	TX: 1710 MHz ~ 1755 MHz	RX: 2110 MHz ~ 2155 MHz
	WCDMA Band 5	TX: 824 MHz ~ 849 MHz	RX: 869 MHz ~ 894 MHz
	LTE Band 2	TX: 1850 MHz ~ 1910 MHz	RX: 1930 MHz ~ 1990 MHz
	LTE Band 4	TX: 1710 MHz ~ 1755 MHz	RX: 2110 MHz ~ 2155 MHz
	LTE Band 5	TX: 824 MHz ~ 849 MHz	RX: 869 MHz ~ 894 MHz
	LTE Band 12	TX: 699 MHz ~ 716 MHz	RX: 729 MHz ~ 746 MHz
	LTE Band 13	TX: 777 MHz ~ 787 MHz	RX: 746 MHz ~ 756 MHz
	WLAN	2412 MHz ~ 2462 MHz	
Antenna Type	WWAN	External (GPS+LTE Combo ANT)	
	WLAN	Ceramic Chip SMD Antenna	
Exposure Category	General Population/Uncontrolled Exposure		
EUT Type	Mobile Device		

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices
2	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01

4 DEVICE CATEGORY AND LEVELS LIMITS

Mobile Device:

CFR Title 47 §2.1091(b)

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC KDB 447498 D04 General RF Exposure Guidance v01 Limit

Evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP20cm in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

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

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 λ/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.

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 Pth (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). Pth is given by Formula (B.2).

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

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).
The 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

5 ASSESSMENT RESULT

5.1 Output Power

WCDMA			
Mode	Band 2	Band 4	Band 5
Conducted Power (dBm)	22.77	22.94	23.13
Antenna Gain (dBi)	2.50	2.50	2.50
ERP/EIRP (dBm)	25.27	25.44	23.48
Note: This report listed the worst case power value, please refer to BL-SZ2320838-501 report for more details.			

LTE					
Mode	Band 2	Band 4	Band 5	Band 12	Band 13
Conducted Power (dBm)	23.41	22.95	23.70	23.53	23.29
Antenna Gain (dBi)	2.50	2.50	2.50	2.50	2.50
ERP/EIRP (dBm)	25.91	25.45	24.05	23.88	23.64
Note: This report listed the worst case power value, please refer to BL-SZ2320838-501 report for more details.					

Mode	WLAN 2.4G		
	802.11b	802.11g	802.11n20
Conducted Power (dBm)	18.02	21.29	21.28
Antenna Gain (dBi)	3.20	3.20	3.20
EIRP (dBm)	21.22	24.49	24.48
Note: This report listed the worst case power value, please refer to BL-SZ2320838-601 report for more details.			

5.2 Tune-up power

Mode		Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
WCDMA	Band 2	[21.00, 23.00]	[23.50, 25.50]	[21.35, 23.35]
	Band 4	[21.00, 23.00]	[23.50, 25.50]	[21.35, 23.35]
	Band 5	[22.00, 24.00]	/	[22.35, 24.35]
LTE	Band 2	[22.00, 24.00]	[24.50, 26.50]	[22.35, 24.35]
	Band 4	[21.00, 23.00]	[23.50, 25.50]	[21.35, 23.35]
	Band 5	[22.00, 24.00]	/	[22.35, 24.35]
	Band 12	[22.00, 24.00]	/	[22.35, 24.35]
	Band 13	[22.00, 24.00]	/	[22.35, 24.35]
WLAN 2.4G	802.11b	[17.00, 19.00]	[20.20, 22.20]	[18.05, 20.05]
	802.11g	[20.00, 22.00]	[23.20, 25.20]	[21.05, 23.05]
	802.11n20	[20.00, 22.00]	[23.20, 25.20]	[21.05, 23.05]
Note1: ERP= EIRP -2.15dB. Note2: According KDB 447498 D04, used the greater of maximum conducted power and ERP to compare with the threshold value Pth.				

5.3 RF Exposure Evaluation Result

Evolution mode	Maximum power (dBm)	Maximum power (mw)	Distance (mm)	Threshold Power (mW)	Power / Limit	Verdict
WCDMA Band 2	23.35	216.27	200	3060.00	0.07	Pass
WCDMA Band 4	23.35	216.27	200	3060.00	0.07	Pass
WCDMA Band 5	24.35	272.27	200	1731.96	0.16	Pass
LTE Band 2	24.35	272.27	200	3060.00	0.09	Pass
LTE Band 4	23.35	216.27	200	3060.00	0.07	Pass
LTE Band 5	24.35	272.27	200	1731.96	0.16	Pass
LTE Band 12	24.35	272.27	200	1460.64	0.19	Pass
LTE Band 13	24.35	272.27	200	1605.48	0.17	Pass
Max WLAN 2.4G	23.05	201.84	200	3060.00	0.07	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency (MHz)	Power /Limit	Σ(Power / Limit) of Max WWAN + WLAN 2.4G	Verdict
Max WWAN	716	0.19	0.26	Pass
Max WLAN 2.4G	2462	0.07		

Note:

1. Σ(Power / Limit): This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for Max WWAN + WLAN 2.4G.
2. Both of the Max WWAN/WLAN 2.4G can transmit simultaneously, the formula of calculated the Power is
   CP1 / LP1 + CP2 / LP2 + ……etc. < 1
   CP = Calculation power
   LP = Limit of power
3. The worst-case situation is 0.26, which is less than “1”. This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
4. The DUT work frequency range used is 699 MHz ~ 716 MHz and 2412 MHz ~ 2462 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.
5. More power list please refer to BL-SZ2320838-501 and BL-SZ2320838-601 test report.

5.5 Conclusion

This EUT is deemed to comply with the reference level limits, therefore the basic restrictions are compliant with human exposure limits.

Statement

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--END OF REPORT--