

TEST REPORT

Applicant: Cavli Inc.
Address: 99 South Almaden Blvd., Suite 600, San Jose, CA
95113 United States
Equipment Type: LTE MODEM/MODULE
Model Name: C16QS-NA (refer to section 2.4)
Brand Name: CAVLI WIRELESS
FCC ID: 2BB64C16QSNA
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04 v01
Sample Arrival Date: Aug. 07, 2023
Test Date: Aug. 08, 2023 - Aug. 22, 2023
Date of Issue: Sep. 19, 2023

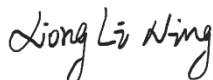
ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

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(Testing Director)



Revision History		
Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Sep. 19, 2023</u>	<u>Initial Issue</u>

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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	<input checked="" type="checkbox"/> Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	<input type="checkbox"/> 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	Cavli Inc.
Address	99 South Almaden Blvd., Suite 600, San Jose, CA 95113 United States

2.2 Manufacturer Information

Manufacturer	Cavli Inc.
Address	99 South Almaden Blvd., Suite 600, San Jose, CA 95113 United States

2.3 General Description for Equipment under Test (EUT)

EUT Name	LTE MODEM/MODULE		
Model Name Under Test	C16QS-NA		
Series Model Name	C16QS-NA-GNAN, C16QS-NA-GNAH, C16QS-NA-S00N, C16QS-NA-S00H		
Description of Model name differentiation	Sub-Variants	GNSS	Internal eSim
	C16QS-NA-S00N	No	No
	C16QS-NA-S00H	No	Yes
	C16QS-NA-GNAN	Yes	No
	C16QS-NA-GNAH	Yes	Yes
(this information provided by the customer)			
Hardware Version	C16QS v3.2		
Software Version	V1.2.5		
Dimensions (Approx.)	N/A		
Weight (Approx.)	N/A		

2.4 Ancillary Equipment

Note: Not Applicable.

2.5 Technical Information

Network and Wireless connectivity	4G Network FDD LTE Band 2/5/12/13/66
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	LTE		
Frequency Range	LTE Band 2	TX: 1850 MHz ~ 1910 MHz	RX: 1930 MHz ~ 1990 MHz
	LTE Band 5	TX: 824 MHz ~ 849 MHz	RX: 869 MHz ~ 894 MHz
	LTE Band 12	TX: 669 MHz ~ 716 MHz	RX: 729 MHz ~ 746 MHz
	LTE Band 23	TX: 777 MHz ~ 787 MHz	RX: 746 MHz ~ 756 MHz
	LTE Band 66	TX: 1710 MHz ~ 1780 MHz	RX: 2110 MHz ~ 2180 MHz
Antenna Type	WWAN	PIFA	
Exposure Category	General Population/Uncontrolled Exposure		
Product 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 ERP_{20cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

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

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.

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). 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

LTE					
Mode	LTE Band2	LTE Band5	LTE Band12	LTE Band13	LTE Band66
Conducted Power (dBm)	22.20	21.73	22.61	22.34	22.40
Antenna Gain (dBi)	2.50	2.50	2.50	2.50	2.50
EIRP/ERP (dBm)	24.70	22.08	22.96	22.57	24.90

Note: This report listed the worst case power value, please refer to BL-SZ2380347-501 report for more details.

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
LTE Band2	[21.00,23.00]	[23.00,25.00]	[20.85,22.85]
LTE Band5	[20.00,22.00]	[21.00,23.00]	[18.85,20.85]
LTE Band12	[21.00,23.00]	[21.00,23.00]	[18.85,20.85]
LTE Band13	[21.00,23.00]	[21.00,23.00]	[18.85,20.85]
LTE Band66	[21.00,23.00]	[23.00,25.00]	[20.85,22.85]

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)	Verdict
LTE Band2	23.00	199.53	200	3060.00	Pass
LTE Band5	22.00	158.49	200	1731.96	Pass
LTE Band12	23.00	199.53	200	1460.64	Pass
LTE Band13	23.00	199.53	200	1605.48	Pass
LTE Band66	23.00	199.53	200	3060.00	Pass

5.4 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--