

TEST REPORT

Applicant: Portable Multimedia Limited
Address: Unit 2, Caerphilly Business Park, Caerphilly, Mid Glamorgan CF83 3ED, United Kingdom
Equipment Type: DashCam
Model Name: NBIQ4KUS
Brand Name: NEXTBASE
FCC ID: 2AOT9-NBIQ4KUS
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04 v01
Sample Arrival Date: Apr. 06, 2023
Test Date: Apr. 23, 2023 – May 10, 2023
Date of Issue: Jun. 07, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.



Tested by: Zhong Weiqiang **Checked by:** Xiong Lining **Approved by:** Tolan Tu
(Testing Director)

*Zhong Weiqiang**Xiong Lining**Tolan Tu*

Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>May 30, 2023</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Jun. 07, 2023</u>	<u>Update applicant information and Section 5.1 Output Power</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	☒ 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	Portable Multimedia Limited
Address	Unit 2, Caerphilly Business Park, Caerphilly, Mid Glamorgan CF83 3ED, United Kingdom

2.2 Manufacturer Information

Manufacturer	Shenzhen Samoon Technology Co., Ltd
Address	9th Floor, 6th Floor west, Block7, ZhongYunTai Industry Park, Songbai Road, Shiyan Town, ShenZhen, China

2.3 Factory Information

Factory	Shenzhen Samoon Technology Co., Ltd
Address	9th Floor, 6th Floor west, Block7, ZhongYunTai Industry Park, Songbai Road, Shiyan Town, ShenZhen, China

2.4 General Description for Equipment under Test (EUT)

EUT Name	DashCam
Model Name Under Test	NBIQ4KUS
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	A3_003
Software Version	0.6.6
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	4G Network LTE FDD Band 2/4/5/12/66/71 Bluetooth (BR+EDR) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20) 5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80) U-NII-1, GPS, GNSS, 24GHz Radar
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth, WIFI, LTE		
Frequency Range	Bluetooth	2400 ~ 2483.5 MHz	
	2.4G WIFI	2412 ~ 2462 MHz	
	5G WIFI	5150 ~ 5250 MHz	
	24GHz Radar	24000 ~ 24250 MHz	
	LTE Band 2	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	LTE Band 4	TX: 1710 ~ 1755 MHz	RX: 2110 ~ 2155 MHz
	LTE Band 5	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	LTE Band 12	TX: 699 ~ 716 MHz	RX: 729 ~ 746 MHz
	LTE Band 66	TX: 1710 ~ 1780 MHz	RX: 2110 ~ 2180 MHz
LTE Band 71	TX: 663 ~ 698 MHz	RX: 617 ~ 652 MHz	
Antenna Type	Bluetooth	PIFA Antenna	
	WIFI	PIFA Antenna	
	24GHz Radar	PCB Antenna	
	LTE	External rod 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

For 300MHz to 6000Mhz

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)

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

For 6000MHz to 10000Mhz

Frequencies above 300 kHz but at distances $R > \lambda/2\pi$, R is the antenna-person separation distance.
 λ =wavelength of transmitted signal.

Can calculate from the frequency of operation using $v=f*\lambda$

v =speed of light= $3*10^8$ m/s

f =frequency(Hz)

Primarily an MPE-based exclusion but also SAR-based where $\lambda/2\pi$ is $< 20\text{cm}$.

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	$19.2 R^2$

Subscripts L and H are low and high; λ is wavelength.
 From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

5 ASSESSMENT RESULT

5.1 Output Power

LTE						
Mode	LTE Band 2	LTE Band 4	LTE Band 5	LTE Band 12	LTE Band 66	LTE Band 71
Conducted Power (dBm)	23.39	23.2	23.51	23.41	23.75	23.02
Antenna Gain (dBi)	0.96	0.96	-0.03	0.96	-5.35	2.65
EIRP	24.35	24.16	23.48	24.37	18.4	25.67
Note: This report listed the worst case conducted power value, please refer to BL-SZ2340426-501 report for more details.						

Mode	Bluetooth	2.4G WIFI	5G WIFI
Conducted Power (dBm)	1.79	16.14	16.16
Antenna Gain (dBi)	2.65	2.65	2.09
EIRP	4.44	18.79	18.25
Note: This report listed the worst case conducted power value, please refer to BL-SZ2340426-601, BL-SZ2340426-602 and BL-SZ2340426-603 report for more details.			

24GHz Radar		
Frequency (MHz)	Peak Power (dBuV/m)	EIRP Power (dBm)
24000	95.93	0.67
Note 1: This report listed the worst case conducted power value, please refer to CQC-IVTS-2023-00188 report for more details. Note 2: Convert the resultant EIRP level to an equivalent electric field strength using the following relationship: $E = \text{EIRP} - 20 \log D + 104.8$ where: E=electric field strength in dBuV/m EIRP =equivalent isotropic radiated power in dBm D=specified measurement distance in meters		

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
LTE Band 2	[22.00,24.00]	[23.00,25.00]	[20.85,22.85]
LTE Band 4	[22.00,24.00]	[23.00,25.00]	[20.85,22.85]
LTE Band 5	[22.00,24.00]	[23.00,25.00]	[20.85,22.85]
LTE Band 12	[22.00,24.00]	[23.00,25.00]	[20.85,22.85]
LTE Band 66	[22.00,24.00]	[17.00,19.00]	[14.85,16.85]
LTE Band 71	[22.00,24.00]	[24.00,26.00]	[21.85,23.85]
Bluetooth	[0.00,2.00]	[3.00,5.00]	[0.85,2.85]
2.4G WIFI	[15.00,17.00]	[17.00,19.00]	[14.85,16.85]
5G WIFI	[15.00,17.00]	[17.00,19.00]	[14.85,16.85]

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

For 300MHz to 6000MHz

Evolution mode	Maximum power (dBm)	Maximum power (mw)	Distance (mm)	Threshold Power (mW)	Power/Limit	Verdict
LTE Band 2	24	251.19	200	3060.00	0.082	Pass
LTE Band 4	24	251.19	200	3060.00	0.082	Pass
LTE Band 5	24	251.19	200	1680.96	0.149	Pass
LTE Band 12	24	251.19	200	1425.96	0.176	Pass
LTE Band 66	24	251.19	200	3060.00	0.082	Pass
LTE Band 71	24	251.19	200	1352.52	0.186	Pass
Bluetooth	2.85	1.93	200	3060.00	0.001	Pass
2.4G WIFI	17	50.12	200	3060.00	0.016	Pass
5G WIFI	17	50.12	200	3060.00	0.016	Pass

For 6000MHz to 10000MHz

Evolution Mode	Distance (cm)	$\lambda / 2 \pi$ (mm)	$\lambda / 2 \pi$ (cm)	$R > \lambda / 2 \pi$
24GHz Radar	20	2.000	0.2	Yes

Evolution Mode	Frequency (MHz)	EIRP (W)	EIRP (dBm)	EIRP (W)	Power / Limit	Verdict
24GHz Radar	24000	0.768	0.67	0.001	0.001	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency (GHz)	Power/Limit	$\Sigma(\text{Power} / \text{Limit})$ of LTE.MAX+Bluetooth+5G WIFI+24GHz Radar	Verdict
LTE.MAX	0.663	0.1860	0.204	Pass
Bluetooth	2.402	0.0010		
5G WIFI	5.15	0.0160		
24GHz Radar	24	0.0010		

Evolution mode	Frequency (GHz)	Power/Limit	$\Sigma(\text{Power} / \text{Limit})$ of LTE.MAX+2.4G WIFI+5G WIFI+24GHz Radar	Verdict
LTE.MAX	0.663	0.1860	0.219	Pass
2.4G WIFI	2.412	0.0160		
5G WIFI	5.15	0.0160		
24GHz Radar	24	0.0010		

Note:

1. $\Sigma(\text{Power} / \text{Limit})$: This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for LTE +Bluetooth+2.4G WIFI+5G WIFI+24GHz Radar.
2. Both of the LTE/Bluetooth/2.4G WIFI/5G WIFI/24GHz Radar can transmit simultaneously, the formula of calculated the Power is

$$\text{CP1} / \text{LP1} + \text{CP2} / \text{LP2} + \dots \text{etc.} < 1$$

CP = Calculation power
LP = Limit of power
3. The worst-case situation is 0.219, 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 2400 ~ 2483.5 MHz, 2412 ~ 2462 MHz, 5150 ~ 5250 MHz, 663 ~ 698 MHz and 24000 ~ 24250 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-SZ2340426-503, BL-SZ2340426-607, BL-SZ2340426-608, BL-SZ2340426-609 and CQC-IVTS-2023-00188 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--