

Test Report

Verified code: 784270

Report No.: E20240129544701-3

Customer: Alps Alpine North America, Inc

Address: 1500 Atlantic Blvd Auburn Hills, Michigan 48326 United States

Sample Name: Car Radio with Bluetooth

Sample Model: KAC-CMD-CTR

Receive Sample Date: Jun.05,2024

Test Date: Jul.09,2024 ~ Sep.18,2024

Reference Document: 47 CFR 2.1091 Radio frequency radiation exposure evaluation: mobile devices.

Test Result: Pass

Prepared by: Huang Lifang Reviewed by: Wu Haoting Approved by: Xiao Liang
Huang Lifang Wu Haoting Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD

Issued Date: 2024-11-22

GRG METROLOGY & TEST GROUP CO., LTD.

Address: No.163, Pingyun Road, West of Huangpu Avenue, Guangzhou, Guangdong, China
Tel: (+86) 400-602-0999 FAX: (+86) 020-38698685 Web: <http://www.grgtest.com>



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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20240129544701-3	Original Issue	2024-09-19

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1. GENERAL DESCRIPTION OF EUT

1.1 APPLICANT

Name: Alps Alpine North America, Inc
Address: 1500 Atlantic Blvd Auburn Hills, Michigan 48326 United States

1.2 MANUFACTURER

Name: Alpine Electronics of America Inc
Address: 1500 Atlantic Blvd Auburn Hills, Michigan 48326 United States

1.3 FACTORY

Name: Huizhou Foryou General Electronics Co., Ltd.
Address: No.2 District A, Foryou Industry Park, No. 1 North Shangxia Road, Dongjiang Hi tech Industry Park, 516005 Huizhou city, Guangdong Province, China(PROC)

1.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Car Radio with Bluetooth
Model No.: KAC-CMD-CTR
Adding Model: KAC-CMD-NP
Models Difference: The model name KAC-CMD-CTR and KAC-CMD-NP have the same technical construction including circuit diagram, PCB LAYOUT, hardware version, software, except the model name different.
Trade Name: Alpine
FCC ID: 2ACH3KACCMDCTR
Power supply: DC 12V,15A
Frequency Band: Bluetooth :
GFSK / $\pi/4$ -DQPSK/8DPSK: 2402MHz~2480MHz
Maximum Transmit Power: GFSK:3.13 dBm
 $\pi/4$ -DQPSK:6.93dBm
8DPSK:4.79dBm
Modulation type: GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps,8DPSK for 3Mbps
Antenna Specification: PCB Antenna with 0dBi gain (Max)
Temperature Range: -20°C ~+60°C
Hardware Version: V04
Software Version: HMS209A-V01.00.19-240605

Sample No: E20240129544701-0001

Note: The basic description of the EUT is provided by the applicant. This report is made Solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

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2. LABORATORY & ACCREDITATIONS

2.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

Add.: No.1301 Guangang Road Xinlan Community, Guanlan Street, Longhua District
Shenzhen, 518110, People's Republic of China.
P.C.: 518110
Tel : 0755-61180008
Fax: 0755-61180008

2.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA A2LA(Certificate #2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada ISED (Company Number: 24897, CAB identifier:CN0069)

USA FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site,
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3. LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE

According to the KDB 447498 D04 Interim General RF Exposure Guidance v01, General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table 4.1 to support an exemption from further evaluation from 300 kHz through 100 GHz.

TABLE 4.1—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.						

For mobile devices that are not exempt per Table 4.1 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 (4.1).

$$P_{\text{th}} (\text{mW}) = ERP_{20 \text{ cm}} (\text{mW}) = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (4.1)$$

In accordance with KDB447498D04 Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluated_k term) shall be used to determine exemption for simultaneous transmission according to Formula

$$\text{MPE Ratio} = \sum_{j=1}^p \frac{ERP_j}{ERP_{\text{th},j}} < 1$$

ERP_j : the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j .

$ERP_{\text{th},j}$: exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

the sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

3.1 MEASUREMENT RESULTS

Predication of MPE limit at a given distance

$EIRP(dBm) = \text{Maximum Tune-up Output power (dBm)} + \text{Maximum antenna gain (dBi)}$

$ERP(dBm) = EIRP(dBm) - 2.15$

R= minimum distance to the center of radiation of the antenna

From the EUT RF output power, the minimum mobile separation distance, $d=20\text{cm}$, as well as the maximum gain of the used as following information, the RF power ERP can be obtained.

Table 1 Antenna Specification

Frequency Band	Antenna type	Internal Identification	Maximum antenna gain (dBi)
2402-2480	PCB antenna	Antenna 1	0dBi

Table 2 Transmit Power for ERP & Maximum Conducted Output Power

Antenna type	Mode	Maximum Conducted output peak Power (dBm)	Target Maximum Conducted Output peak Power (dBm)	Tolerance (dB)	Maximum Tune-up Maximum Conducted Output peak Power (dBm)	Maximum Tune-up ERP (dBm)
PCB antenna	GFSK	3.13	3.50	± 1	4.50	2.35
	$\pi/4$ -DQPSK	6.93	7.00	± 1	8.00	5.85
	8DPSK	4.79	5.00	± 1	6.00	3.85

Note:

- 1) The maximum output Power of BLE were refer to the module report.
- 2) Maximum Tune-up ERP of External copper antenna = Maximum Tune-up Maximum Conducted Output peak Power + antenna gain -2.15.

STANDALONE MPE

Mode	Antenna type	Frequency (MHz)	Maximum Tune-up ERP (dBm)	Maximum Tune-up ERP (mW)	Threshold ERP (mW)	Verdict
GFSK	PCB antenna	2480	2.35	1.718	768	PASS
$\pi/4$ -DQPSK		2480	5.85	3.846		PASS
8DPSK		2480	3.85	2.427		PASS

Remark:

a. RF Exposure use distance is 20cm from manufacturer declaration of user manual.

b. Threshold $ERP(W) = 19.2R^2(W) = 19.2 * 0.2 * 0.2(W) = 0.7680(W) = 768(mW)$.

4. CONCLUSION

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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