

TEST REPORT

Applicant: Shenzhen Huatai Electronics Co., Ltd
Address: Room 1703, Building A, Yonghuayuan Business Building, No. 6 Baotian Second Road, Chengtian Community, Xixiang Street, Shenzhen, Guangdong Province, China
Equipment Type: mmWave Reversing Radar
Model Name: RA2 (refer to section 2.3)
Brand Name: N/A
FCC ID: 2BDGIRA2
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04 v01
Sample Arrival Date: Apr. 30, 2026
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ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Lining**Checked by:** Xu Rui**Approved by:** Liao Jianming
(Technical Director)

Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	601, Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☐ Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen, Guangdong
	☒ 1/F., Building B, Ganghongji High-Tech Intelligent Industrial Park, No.1008, Songbai Road, Yangguang Community, Xili Subdistrict, Nanshan District, Shenzhen, Guangdong
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	Shenzhen Huatai Electronics Co., Ltd
Address	Room 1703, Building A, Yonghuayuan Business Building, No. 6 Baotian Second Road, Chengtian Community, Xixiang Street, Shenzhen, Guangdong Province, China

2.2 Manufacturer Information

Manufacturer	Shenzhen Huatai Electronics Co., Ltd
Address	Room 1703, Building A, Yonghuayuan Business Building, No. 6 Baotian Second Road, Chengtian Community, Xixiang Street, Shenzhen, Guangdong Province, China

2.3 General Description for Equipment under Test (EUT)

EUT Name	mmWave Reversing Radar
Model Name Under Test	RA2
Series Model Name	RA3, RA4, RA5
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and shell color. (this information provided by the applicant)
Hardware Version	V1.0
Software Version	V1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	FMCW, 433MHz
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	FMCW, 433MHz	
Frequency Range	FMCW	10.50 ~ 10.55 GHz
	433MHz	433.92 MHz
Antenna Type	FMCW	PCB Antenna
	433MHz	Integral Antenna
Exposure Category	General Population/Uncontrolled Exposure	
Product Type	Mobile Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01

3.2 Limit Standards

No.	Identity	Document Title
1	47 CFR Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices

4 DEVICE CATEGORY AND LEVELS LIMITS

Mobile Devices:

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

Mode	433MHz
Field Strength (dB μ V/m)	69.68
Conducted Power (dBm)	-19.22
Antenna Gain (dBi)	-5.04
ERP (dBm)	-26.41

Note 1: This report listed the worst case conducted power value, please refer to Ti-EE26040395-601 report for more details.

Note 2: Add the appropriate maximum ground reflection factor to the EIRP level (6dB for frequencies $\leq$ 30MHz, 4.7dB for frequencies between 30MHz and 1000MHz, inclusive and 0dB for frequencies $>$ 1000 MHz).

Note 3: Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$$E = \text{EIRP} - 20\log D + 104.8 - \text{maximum ground reflection factor}$$

Note 4: For frequencies below 1000 MHz, only ERP (Effective Radiated Power) is used. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$$E = \text{ERP} - 20\log D + 104.8 - \text{maximum ground reflection factor}$$

where:

E=electric field strength in dB μ V/m

EIRP =equivalent isotropic radiated power in dBm

ERP = effective radiated power in dBm

D=specified measurement distance in meters

Mode	FMCW
Field Strength (dB μ V/m)	80.56
Conducted Power (dBm)	-18.69
Antenna Gain (dBi)	4.5
EIRP (dBm)	-14.19

Note 1: This report listed the worst case conducted power value, please refer to Ti-EE26040395-602 report for more details.

Note 2: Add the appropriate maximum ground reflection factor to the EIRP level (6dB for frequencies $\leq$ 30MHz, 4.7dB for frequencies between 30MHz and 1000MHz, inclusive and 0dB for frequencies $>$ 1000 MHz).

Note 3: Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$$E = \text{EIRP} - 20\log D + 104.8 - \text{maximum ground reflection factor}$$

Note 4: For frequencies below 1000 MHz, only ERP (Effective Radiated Power) is used. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$$E = \text{ERP} - 20\log D + 104.8 - \text{maximum ground reflection factor}$$

where:

E=electric field strength in dB μ V/m

EIRP =equivalent isotropic radiated power in dBm

ERP = effective 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)
433MHz	[-21.00, -19.00]	/	[-28.19, -26.19]
FMCW	[-20.00, -18.00]	[-15.50, -13.50]	[-17.65, -15.65]

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 30MHz to 6000MHz

Evolution Mode	Maximum Power (dBm)	Maximum Power (mw)	Distance (cm)	Threshold Power (mW)	Power / Limit	Verdict
433MHz	-19.00	0.01	20	885.20	0.001	Pass

For 6000MHz to 100000MHz

Evolution Mode	Distance (cm)	$\lambda / 2 \pi$ (m)	$\lambda / 2 \pi$ (cm)	$R > \lambda / 2 \pi$
FMCW	20	0.005	5.000	Yes

Evolution Mode	Threshold ERP (W)	ERP (dBm)	ERP (W)	P/Plimit	Verdict
FMCW	0.768	-15.65	0.001	0.001	Pass

5.4 Collocated Power Calculation

Evolution Mode	Power /Limit	$\Sigma(\text{Power / Limit})$ of 433MHz + FMCW	Verdict
433MHz	0.001	0.002	Pass
FMCW	0.001		

Note:

- $\Sigma(\text{Power / Limit})$: This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for 433MHz + FMCW.
- Both of the 433MHz/FMCW can transmit simultaneously, the formula of calculated the Power is $CP1 / LP1 + CP2 / LP2 + \dots \text{etc.} < 1$
 CP = Calculation power
 LP = Limit of power
- The worst-case situation is 0.002, which is less than "1". This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
- The DUT work frequency range used is 433.92 MHz and 10.50 GHz ~ 10.55 GHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.

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--