

RF EXPOSURE EVALUATION REPORT

Application No.: GZCR2106020387HS
Applicant: Milwaukee Electric Tool Corporation
Address of Applicant: 13135 W Lisbon Rd, Brookfield, WI 53005
Manufacturer: Milwaukee Tool
Address of Manufacturer: 13135 W Lisbon Rd, Brookfield, WI 53005
Factory: Computime Limited
Address of Factory: Yuekenguangyu Industrial Park, Kangqiao Road 88#, Danzhotou Community, Nanwan Street Office, Longgang District, Shenzhen, Guangdong, China

Equipment Under Test (EUT):

EUT Name: One-Key Bluetooth Tracking Tag
Model No.: 48-21-2301, 48-21-2302, 48-21-2310
 * Please refer to section 2 of this report which indicates which item was actually evaluated and which were electrically identical.

Trade Mark: 

Standard(s) : 47 CFR Part 1.1310
 47 CFR Part 2.1093
 KDB447498 D01 General RF Exposure Guidance DR04-44307

Date of Receipt: 2021-06-03
Date of Evaluation: 2021-06-16
Date of Issue: 2021-07-08

Evaluation Result:	Pass*
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* In the configuration evaluated, the EUT complied with the standards specified above.



Kobe Jian
 EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-07-08		Original

Authorized for issue by			
Tested By		Jim Li	
		Jim Li/Project Engineer	
Reviewed By		Ricky Liu	
		Ricky Liu/Reviewer	



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2 Evaluation Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
RF Exposure	47 CFR Part 1.1310 47 CFR Part 2.1093 KDB447498 D01 General RF Exposure Guidance DR04-44307	KDB447498 D01 General RF Exposure Guidance DR04-44307	47 CFR Part 1.1310 KDB447498 D01 General RF Exposure Guidance DR04- 44307	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

☒ Declaration of EUT Family Grouping:

Model No.: 48-21-2301, 48-21-2302, 48-21-2310

Only the model 48-21-2301 was tested.

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on the number of product in the package (1 for 48-21-2301, 2 for 48-21-2302 and 10 for 48-21-2310).



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4 General Information

4.1 Details of E.U.T.

Power supply: DC 3V=Size "CR3202" Battery x 1
Cable(s): N/A
RF Character: Refer to report GZCR210602038702 for NFC.
Refer to report GZCR210602038703 for BT BLE.

4.2 Evaluating Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.



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4.3 Test Facility

The facility is recognized, certified, or accredited by the following organizations:

● **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

● **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

● **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

● **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

● **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

● **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

● **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

● **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

4.4 Deviation from Standards

None

4.5 Abnormalities from Standard Conditions

None



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5 Technical Requirements Specification

5.1 RF Exposure Evaluation

5.1.1 Limit & Test Method

According to §1.1310, the limit for general population/uncontrolled exposures:

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1500	/	/	f/1500	<30
1500-100,000	/	/	1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Note: Limit for 13.56MHz is 60.77 V/m

According to §2.1093, the limit for Radiofrequency radiation exposure evaluation: portable devices.

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

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

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_{20cm} is per Formula (B.1).

Example values shown in Table B.2 are for illustration only.



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5.1.2 Conclusion

Refer to report No. GZCR210602038702 & GZCR210602038703 for EUT test max EIRP value for BT and E-field for NFC.

Normal use condition for Distance between antenna and body: 5 mm

Test Mode	Frequency (MHz)	EIRP/ E-field strength	P/E-field strength	P _{th} /E-field strength
BLE_1M	2402	-4.98 dBm	0.318 mW	2.79 mW **
	2440	-4.01 dBm	0.397 mW	2.75 mW **
	2480	-3.69 dBm	0.428 mW	2.72 mW **
BLE_2M	2402	-4.87 dBm	0.326 mW	2.79 mW **
	2440	-4.00 dBm	0.398 mW	2.75 mW **
	2480	-3.64 dBm	0.433 mW	2.72 mW **
NFC	13.56	21.59 dBuV/m@10m	48.0352 V/m@0.005m*	60.77 V/m**

*: E-field (dBuV/m @0.005m) = E-field (dBuV/m @10m) + 40log(10/0.005)=153.63 dBuV/m @0.005m

E-field (V/m)= 10[^][E-field (dBuV/m) /20] × 10⁻⁶=48.0352 V/m@0.005m*

** Refer to formula B.1 & B.2

For example:

Where:

f = 2.480 GHz

d = 0.5 cm

ERP_{20cm} = 3060

x= -log₁₀(60/ERP_{20cm} *√f)

= -log₁₀(60/3060 *√2.48)

= -log₁₀(0.01245)

= 1.9047

So, P_{th} = ERP_{20cm} * (d/20 cm)^x

= 3060*(0.5/20)^{1.9047}

= 3060*(0.025)^{1.9047}

=3060*0.00089

=2.72

According to the formula C.1, we can calculate MPE.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1 \quad (C.1)$$

NFC 13.56MHz and BT modules can transmit simultaneously, so the maximum rate of MPE is 48.0352/60.77+0.433/2.72 =0.790+0.157 = 0.947 <1.0.

According to the KDB447498 D01 section 2.2 determine the device is exclusion from SAR test.



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6 EUT Constructional Details (EUT Photos)

Refer to external and internal photos for GZCR2106020387HS

- End of the Report -



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