



RF Exposure Evaluation

FCC ID: 2BC2U-4295**IC: 31675-4295**

1. Client Information

Applicant	:	Shenzhen LC Co., Ltd
Address	:	Rooms 602, Building 5, Fenghe Industrial Park, No. 1301-50 Guangang Road, Xinlan Community, Guanlan Street, Longhua District, Shenzhen, China.
Manufacturer	:	Shenzhen Leqi Innovation Co., Ltd.
Address	:	Rooms 103, 501 and 601, Building 5, Fenghe Industrial Park, Nos. 1301-50 Guangang Road, Longhua District, Shenzhen, Guangdong, China.

2. General Description of EUT

EUT Name	:	Wireless Handwheel Controller
HVIN/Model No.	:	4295
Sample ID	:	RW-C-202401-0340-2-1#& RW-C-202401-0340-2-2#
Product Description	:	Operation Frequency: ZigBee: 2405MHz~2480MHz
	:	Number of Channel: ZigBee: 16channels
	:	Antenna Gain: 1.76dBi PIFA Antenna
Power Supply	:	USB Input:5V2A or DC 3.7V 1400mAh by rechargeable Li-ion battery
Software Version	:	V1.2
Hardware Version	:	V1
Remark: The antenna gain provided by the applicant, the adapter and verified for the RF conduction test and adapter provided by TOBY test lab.		

Note: More test information about the EUT please refer the RF Test Report.

The RF Exposure Evaluation for FCC:

SAR Test Exclusion Calculations

FCC: According to 447498 D04 Interim General RF Exposure Guidance v01.

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).

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

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



Calculation:

Test separation: 5mm					
ZigBee Mode					
Frequency (GHz)	Conducted Power (dBm)	Turn-up Power Tolerance (dB)	Max power of tune up tolerance (dBm)	Max power of tune up tolerance (mW)	Limit P _{th} (mW)
2.405	1.292	1±1	2	1.585	3
2.445	1.284	1±1	2	1.585	3
2.480	0.919	1±1	2	1.585	3

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 D04, No SAR is required.



The RF Exposure Evaluation for IC:

SAR Test Exclusion Calculations

IC: According to RSS-102 — Radio Frequency (RF) Exposure Compliance of Radio Communication Apparatus (All Frequency Bands) Issue 5: March 19, 2015

(1) Clause 2.5.1: Exemption limits for Routine Evaluation – SAR Evaluation

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance					
Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance					
Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW



Calculation:

ZigBee Mode							
Frequency (MHz)	Max Conducted Power (dBm)	Tune-up Power (dBm)	Antenna Gain (dBi)	Max. E.I.R.P (dBm)	Max. E.I.R.P (mw)	Limit	Result
2405	1.292	1±1	1.76	3.76	2.38	≤4mw	PASS
2445	1.284	1±1	1.76	3.76	2.38	≤4mw	PASS
2480	0.919	1±1	1.76	3.76	2.38	≤4mw	PASS

Note: At separation distance of ≤5 mm

Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1093 and the RSS-102§4 Table 4 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06, No SAR is required.

-----END OF THE REPORT-----

