



RF Exposure Evaluation

FCC ID: 2AZWI-3262LEQI**IC: 27649-3262LEQI**

1. Client Information

Applicant	:	Shenzhen Leqi Network Technology Co., LTD
Address	:	Rooms 103, 501 and 601, Building 5, Fenghe Industrial Park, Nos. 1301-50 Guanguang Road, Longhua District, Shenzhen, Guangdong, China.
Manufacturer	:	Shenzhen Leqi Network Technology Co., LTD
Address	:	Rooms 103, 501 and 601, Building 5, Fenghe Industrial Park, Nos. 1301-50 Guanguang Road, Longhua District, Shenzhen, Guangdong, China.

2. General Description of EUT

EUT Name	:	Wireless Handwheel Controller
HVIN/Model No.	:	3262
Sample ID	:	RW-C-202208-0186-38-1#& RW-C-202208-0186-38-2#
Product Description	:	Operation Frequency: ZigBee: 2405MHz~2480MHz Bluetooth LE V4.0: 2402MHz~2480MHz
		Number of Channel: ZigBee: 16channels BLE: 40channels
		RF Output Power: ZigBee: 1.28dBm BLE: -2.94dBm
		Antenna Gain: 2.57dBi FPC Antenna for ZigBee 2.96dBi PCB Antenna for BLE
Power Supply	:	Input: DC 5V/2A DC 3.7V by 1400mAh Rechargeable Li-ion battery
Software Version	:	V1.2
Hardware Version	:	V1.0
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

1. FCC: According to KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies v06.

(1) Clause 4.3: General SAR test reduction and exclusion guidance

Sub clause 4.31: Standalone SAR test exclusion considerations

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6GHz at test separation distance ≤ 5 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation, mm})] \cdot [\sqrt{f_{\text{(GHz)}}}] \leq 3.0$ for 1-g SAR

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation, mm})] \cdot [\sqrt{f_{\text{(GHz)}}}] \leq 7.5.0$ for 10-g SAR

2. Summary simultaneous transmission for SAR Exclusion

The SAR exemption limits outlined in clause 4.3.2(b) of KDB 447498 have been derived based on an approximate SAR value of 0.4 W/kg using half-wave dipole antennas Footnote 1. As such, when simultaneous transmitter SAR evaluations include transmitters that have been exempt from routine SAR evaluation, the SAR must be estimating based on the ratio between the maximum tune-up tolerance limit of the transmitter that has been exempt and the exemption limit at the specific distance and frequency for that transmitter. This ratio must be multiplied by 0.4 W/kg (2.0 W/kg for controlled use and 1.0 W/kg for limb worn devices) in order to calculate the estimated SAR level.

The estimate SAR value is calculated based the following equation:

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/kg

1) $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{(GHz)}}/x}]$ W/kg, for test separation distances ≤ 50 mm;

where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is > 50 mm.³⁷

The $[\Sigma$ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + $[\Sigma$ of MPE ratios] is ≤ 1.0 .

The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04 , and the $[\Sigma$ of MPE ratios] is ≤ 1.0 .

3. 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	1.28	0.5±1	1.5	1.413	3
2.445	0.79	0.5±1	1.5	1.413	3
2.480	1.18	0.5±1	1.5	1.413	3
BLE					
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)
2.402	-2.94	-3±1	-2	0.631	3
2.440	-3.58	-3±1	-2	0.631	3
2.480	-3.70	-3±1	-2	0.631	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.

4. Summary simultaneous transmission results

Simultaneous Transmission for SAR Exclusion

The sample support one ZigBee modular and one BLE modular, they supports difference antenna, need consider simultaneous transmission;
 \sum of (the highest measured or estimated SAR_{ZigBee} + SAR_{BLE})/1.6 = (0.0668+0.0335)/1.6 = 0.0627 < 1.0;

The RF Exposure Evaluation for IC:

SAR Test Exclusion Calculations

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

6. 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	1.28	0.5±1	2.57	4.07	2.553	≤4mw	PASS
2445	0.79	0.5±1	2.57	4.07	2.553	≤4mw	PASS
2480	1.18	0.5±1	2.57	4.07	2.553	≤4mw	PASS
BLE							
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
2.402	-2.94	-3±1	2.96	0.96	1.247	≤4mw	PASS
2.440	-3.58	-3±1	2.96	0.96	1.247	≤4mw	PASS
2.480	-3.70	-3±1	2.96	0.96	1.247	≤4mw	PASS
Note: At separation distance of ≤5 mm							

7. Simultaneous Transmission for SAR Exclusion

The sample supports 2 antennas for ZigBee and BLE, need consider simultaneous transmission;

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/kg. (watts per kilogram)

ZigBee Max E.I.R.P is 4.07dBm=2.553mW,

BLE Max E.I.R.P is 0.96dBm=1.247mW

The ZigBee estimated Sar =(2.553mW/4mW)*0.4W/kg=0.2553W/kg

The BLE estimated Sar=(1.247mW/4mW)*0.4W/kg=0.1247W/kg

∑ of (the highest measured or estimated SAR ZigBee +SAR BLE)= 0.2553 W/kg +0.1247 W/kg =0.38 W/kg<0.4W/kg

8. 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 REPORT-----