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RF Exposure Evaluation Report

Application No.: KSCR2502000154AT
FCC ID: 2BEWX-TPA08
Applicant: Zhejiang Lingzhu Technology Co., Ltd.
Address of Applicant: Room 302, No 1 Building Huace Center, Xihu District, Hangzhou City, Zhejiang Province, China
Manufacturer: Zhejiang Lingzhu Technology Co., Ltd.
Address of Manufacturer: Room 302, No 1 Building Huace Center, Xihu District, Hangzhou City, Zhejiang Province, China
Factory: Ningbo Wise Electronic Technology Co., Ltd.
Address of Factory: 104, Factory Building 13, Huiding Chuangzhi Park, No. 277 Shengyuan Road, Jiangkou Street, Fenghua District, Ningbo, Zhejiang
Equipment Under Test (EUT):
EUT Name: Control Panel 8 Pro
Model No.: TPA08-M3U
Standard(s) : FCC Rules 47 CFR §2.1091
KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt: 2025-02-07
Date of Test: 2025-02-21 to 2025-03-04
Date of Issue: 2025-03-04

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



Revision Record			
Version	Description	Date	Remark
00	Original	2025-03-04	/

Authorized for issue by:				
Tested By		Damon Zhou		
		Damon_Zhou/Project Engineer		
Approved By		Terry Hou		
		Terry Hou /Reviewer		



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3 General Information

3.1 General Description of E.U.T.

Power supply:	AC 100-240V,50/60Hz
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3.2 Technical Specifications

BLE

Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	PIFA Antenna
Antenna Gain:	2.3dBi(Provided by the manufacturer)

BT

Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PIFA Antenna
Antenna Gain:	2.54dBi(Provided by the manufacturer)

2.4GHz WiFi

Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz; 802.11n(HT40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK); 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11;802.11n(HT40):7
Channel Spacing:	5MHz
Antenna Type:	PIFA Antenna
Antenna Gain:	3.63dBi(Provided by the manufacturer)

Zigbee

Operation Frequency:	2405MHz to 2480MHz
Modulation Type:	O-QPSK
Number of Channels:	16
Channel Spacing:	5MHz
Antenna Type:	PIFA Antenna
Antenna Gain:	0.64dBi(Provided by the manufacturer)

**5GHz WiFi**

Operation Frequency/Number of channels (20MHz):	U-NII-1:5180-5240MHz (4 Channels); U-NII-2A: 5260-5320MHz (4 Channels); U-NII-2C: 5500-5700MHz (11 Channels); U-NII-3: 5745-5825MHz (5 Channels)
Operation Frequency/Number of channels/(40MHz):	U-NII-1:5190-5230MHz (2 Channels); U-NII-2A: 5270-5310MHz (2 Channels); U-NII-2C: 5510-5670MHz (5 Channels); U-NII-3: 5755-5795MHz (2 Channels)
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing:	802.11a/n20: 20MHz; 802.11n40: 40MHz
DFS Function:	Slave without Radar detection
TPC Function:	Without TPC function
Antenna Type:	PIFA Antenna
Antenna Gain:	4.92dBi(Provided by the manufacturer)



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3.3 Separation Distance

Separation distance between the antenna to person (R):	> 20cm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander. R has been stated in user manual.	

3.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1.SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc) is provided by the applicant. (if applicable).

2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).

3. Sample source: sent by customer.

3.5 Test Facility

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

- **A2LA**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

- **FCC**

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

- **ISED**

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

- **VCCI**

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4 RF Exposure Test Exemptions

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 FCC RF Exposure Test Exemptions for single RF sources

4.1.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

4.1.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz. The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, **R must be at least $\lambda/2\pi$** , where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP 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 (1.64 linear value).

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^2f
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. R: Separation distance between the antenna to person						

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

Limit calculation				
Frequency range	Frequency(MHz)	$\lambda/2\pi$ (m)	R(m)	Threshold ERP(W)
1.34~30MHz	13.56	3.5229	3.6000	243.167
300~1500MHz	433	0.1103	0.6000	1.995
1500~100000MHz	2462	0.0194	0.2000	0.768
1500~100000MHz	5825	0.0082	0.2000	0.768

4.1.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known. The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

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 **0.5cm to 40cm** 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).

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	d(cm)	Pth (mW)
0.3~1.5	0.43317	0.986	20	883.667
1.5~6	2.462	1.903	20	3060.000

4.2 RF Exposure Test Exemptions for Simultaneous Transmission

The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

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. In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

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

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th} , including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).

P_{th,i} = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source *i*.

ERP_j = the ERP of fixed, mobile, or portable RF source *j*.

ERP_{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 formula of paragraph (b)(3)(i)(C) of this section.

Evaluated_k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit_k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source *k*, as applicable from § 1.1310 of this chapter.

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report KSCR250200015401, KSCR250200015402, KSCR250200015403, KSCR250200015404, KSCR250200015405.

BLE

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
1M	2402	9.47	8.85
	2440	9.66	9.25
	2480	9.13	8.18

BT

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
GFSK	2402	8.56	7.18
	2441	8.66	7.35
	2480	8.06	6.40
$\pi/4$ DQPSK	2402	6.17	4.14
	2441	6.75	4.73
	2480	5.40	3.47
8DPSK	2402	6.76	4.74
	2441	6.76	4.74
	2480	5.89	3.88

2.4GHz WiFi

Test Mode	Test Channel	Ant	Power [dBm]	Power [mW]
11B	2412	Ant1	13.57	22.75
11B	2437	Ant1	13.35	21.63
11B	2462	Ant1	13.87	24.38
11G	2412	Ant1	13.51	22.44
11G	2437	Ant1	13.25	21.13
11G	2462	Ant1	13.56	22.70
11N20SISO	2412	Ant1	13.30	21.38
11N20SISO	2437	Ant1	13.09	20.37
11N20SISO	2462	Ant1	13.49	22.34
11N40SISO	2422	Ant1	13.94	24.77
11N40SISO	2437	Ant1	13.92	24.66
11N40SISO	2452	Ant1	14.02	25.23



5GHz WiFi

Mode	Test Frequency (MHz)	Ant	Antenna Power (dBm)	Antenna Power (mW)
802.11a	5180	Ant1	13.17	20.75
	5200	Ant1	13.18	20.80
	5240	Ant1	13.25	21.13
	5260	Ant1	13.11	20.46
	5300	Ant1	13.57	22.75
	5320	Ant1	13.72	23.55
	5500	Ant1	13.67	23.28
	5580	Ant1	12.98	19.86
	5700	Ant1	13.10	20.42
	5745	Ant1	13.01	20.00
	5785	Ant1	12.92	19.59
	5825	Ant1	12.86	19.32
802.11n (HT20)	5180	Ant1	12.38	17.30
	5200	Ant1	11.85	15.31
	5240	Ant1	12.31	17.02
	5260	Ant1	12.83	19.19
	5300	Ant1	11.78	15.07
	5320	Ant1	12.32	17.06
	5500	Ant1	12.93	19.63
	5580	Ant1	11.45	13.96
	5700	Ant1	12.94	19.68
	5745	Ant1	12.48	17.70
	5785	Ant1	12.26	16.83
	5825	Ant1	12.03	15.96
802.11n (HT40)	5190	Ant1	12.57	18.07
	5230	Ant1	11.76	15.00
	5270	Ant1	13.37	21.73
	5310	Ant1	12.47	17.66
	5510	Ant1	12.36	17.22
	5550	Ant1	11.85	15.31
	5670	Ant1	12.26	16.83



	5755	Ant1	11.71	14.83
	5795	Ant1	10.57	11.40

Zigbee

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
Zigbee	2405	6.73	4.71
	2440	7.00	5.01
	2480	6.34	4.31

5.2 RF Exposure Calculation

Band	Frequency	Max power (dBm)	Ant Gain (dBi)	EIRP (dBm)	Max power (mW)	Limit (mW)	Distance R (cm)
BLE	2402	9.66	2.3	11.96	15.70	3060	20
BT	2402	8.66	2.54	11.2	13.18	3060	20
WLAN 2.4GHz	2400	14.02	3.63	17.65	58.21	3060	20
WLAN 5GHz B1	5150	13.25	4.92	18.17	65.61	3060	20
WLAN 5GHz B2	5250	13.72	4.92	18.64	73.11	3060	20
WLAN 5GHz B3	5470	13.67	4.92	18.59	72.28	3060	20
WLAN 5GHz B4	5725	13.01	4.92	17.93	62.09	3060	20
Zigbee	2405	7	0.64	7.64	5.81	3060	20

For single RF source :

	Evaluation method	Separation distance between the antenna to person (R)
☐	Blanket 1 mW Blanket Exemption	Regardless of separation distance
☐	MPE-based Exemption(ERP)	$R \geq (\lambda / 2 \pi)$
☒	SAR-based Exemption(P_{th})	$0.5\text{cm} < R < 40\text{cm}$

For multiple RF sources:

The 2.4GHz/5GHz WLAN & BLE & Zigbee can transmit simultaneously, but $15.70/3060 + 73.11/3060 + 5.81/3060 = 0.031 \leq 1$. So the MPE of collocated transmitter is compliant.

--End of the Report--