RF Exposure Evaluation Report

APPLICANT	:	**Ningbo Lingzhu Technology CO., Ltd.**
EQUIPMENT	:	**Smart Control Panel L**
MODEL NAME	:	**TPP05-Z(US)**
FCC ID	:	**2A789-TPP05**
STANDARD	:	**47 CFR Part 2.1091** **FCC KDB 447498 D01 V06**

The product evaluation date was started from Apr. 18, 2024 and completed on Apr. 18, 2024. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
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People's Republic of China

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA372501-01	Rev. 01	Initial issue of report.	Apr. 23, 2024

1. Administration Data

1.1. Testing Laboratory

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-KS	CN1257	314309

Applicant	
Company Name	Ningbo Lingzhu Technology CO., Ltd.
Address	No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC

Manufacturer	
Company Name	Ningbo Lingzhu Technology CO., Ltd.
Address	No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Smart Control Panel L
Model Name	TPP05-Z(US)
FCC ID	2A789-TPP05
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz ZigBee: 2405 MHz ~ 2480 MHz
Mode	WLAN 2.4GHz : 802.11b/g/n/ HT20/HT40 WLAN 5GHz : 802.11a/n HT20/HT40 Bluetooth LE ZigBee: O-QPSK
Antenna Gain	WLAN2.4GHz: -0.75 dBi WLAN 5.2GHz: 1.75 dBi WLAN 5.3GHz: 1.75 dBi WLAN 5.5GHz: 1.75 dBi WLAN 5.8GHz: 1.75 dBi Bluetooth: -2.07 dBi ZigBee: -0.95 dBi
Antenna Type	WLAN: IPEX Antenna ZigBee: IPEX Antenna Bluetooth: IPEX Antenna
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two samples, only LCD panel is different, and the differences do not affect the MPE analysis results.
3. This is a variant report for TPP05-Z(US), the difference please refer to the TPP05-Z(US)_ Class II Permissive Change letter exhibit submitted. According to the differences, only added Bluetooth BLE evaluation based on original report (Sporton Report Number FA372501).

Comments and Explanations:
1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. 2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.

3. Maximum RF average output tune up power among production units

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)
2.4GHz	802.11b	23.00
	802.11g	23.00
	802.11n-HT20	23.00
	802.11n-HT40	22.00

<WLAN 5GHz>

Mode		Maximum Average Power (dBm)
WLAN 5.2GHz	802.11a	20.0
	802.11n-HT20	20.0
	802.11n-HT40	20.0
WLAN 5.3GHz	802.11a	18.0
	802.11n-HT20	20.0
	802.11n-HT40	21.0
WLAN 5.5GHz	802.11a	20.0
	802.11n-HT20	21.0
	802.11n-HT40	21.0
WLAN 5.8GHz	802.11a	21.0
	802.11n-HT20	22.0
	802.11n-HT40	23.0

<ZigBee>

Mode		Maximum Average power(dBm)
2.4GHz	ZigBee	19.00

<Bluetooth>

Mode		Maximum Average power(dBm)
Bluetooth	LE	8.0

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
2.4GHz WLAN	2412.0	-0.75	23.00	22.250	167.880	0.033	1.000	**0.033**
5.2GHz WLAN	5180.0	1.75	20.00	21.750	149.624	0.030	1.000	0.030
5.3GHz WLAN	5260.0	1.75	21.00	22.750	188.365	0.037	1.000	0.037
5.5GHz WLAN	5500.0	1.75	21.00	22.750	188.365	0.037	1.000	0.037
5.8GHz WLAN	5745.0	1.75	23.00	24.750	298.538	0.059	1.000	**0.059**
Bluetooth	2402.0	-2.07	8.00	5.930	3.917	0.001	1.000	**0.001**
ZigBee	2405.0	-0.95	19.00	18.050	63.826	0.013	1.000	**0.013**

Note:
1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. Chose the maximum power to do MPE analysis.

5.2. Collocated Power Density Calculation

ZigBee Power Density / Limit	WLAN 2.4GHz Power Density / Limit	Σ(Power Density / Limit) of ZigBee + WLAN 2.4GHz
0.013	0.033	0.046

ZigBee Power Density / Limit	WLAN 5GHz Power Density / Limit	Σ(Power Density / Limit) of ZigBee + WLAN 5GHz
0.013	0.059	0.072

ZigBee Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of Bluetooth +ZigBee + WLAN 2.4GHz
0.013	0.001	0.014

Note:
1. According to the EUT characteristic, WLAN 2.4GHz and WLAN 5GHz cannot transmit simultaneously.
2. According to the EUT characteristic, Bluetooth and WLAN(WLAN 2.4GHz or 5GHz) cannot transmit simultaneously.
3. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for ZigBee + WLAN2.4GHz/WLAN5GHz, and ZigBee + Bluetooth.
4. Considering the ZigBee module collocation with WLAN transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

------THE END------