

Radio Exposure Evaluation Report

FCC ID : 2AGBW9290035826X
Equipment : Philips HUE bridge 3.0
Brand Name : PHILIPS : hue : 
Model Name : 9290035826
Applicant : Signify (China) Investment Co., Ltd.
Building 9, Lane 888, Tianlin Road, Minhang
District, Shanghai 200233 China
Manufacturer : Signify (China) Investment Co., Ltd.
Building 9, Lane 888, Tianlin Road, Minhang
District, Shanghai 200233 China
Standard : 47 CFR FCC Part 2 Subpart J, section 2.1091

The product was received on Jan. 17, 2024, and testing was started from Feb. 07, 2024 and completed on Mar. 15, 2024. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR FCC Part 2 Subpart J, section 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Hsinhua Laboratory, the test report shall not be reproduced except in full.



Approved by: Jackson Tsai

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Photographs of EUT V01



History of this test report

Report No.	Version	Description	Issued Date
FA410307	01	Initial issue of report	Jun. 07, 2024
FA410307	02	Update brand name (This report is the latest version replacing for the report issued on Jun. 07, 2024)	Jun. 14, 2024



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

None

Reviewed by: Barry Hsiao

Report Producer: Ann Hou

1 General Description

1.1 Information

1.1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Bluetooth	2400-2483.5	2402-2480	LE: DSSS (GFSK)
ZigBee	2400-2483.5	2405-2480	DSSS (O-QPSK)

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Support
1	LITEON	CO0307AM	Print	N/A	2.4G+5G+BT
2	LITEON	CO0307AM	Print	N/A	Zigbee

Ant.	Port	Gain (dBi)			
		2.4G	5G	BT	Zigbee
1	1	2.7	2.8	2.7	-
2	2	-	-	-	2.8

Note 1: The EUT has two antennas.

For 2.4GHz function:

For IEEE 802.11 b/g/n mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive.

For 5GHz function:

For IEEE 802.11 a/n/ac mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive.

For BT function:

For IEEE 802.15.1 Bluetooth mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive.

For Zigbee function:

For IEEE 802.15.4 Zigbee mode (1TX/1RX)

Ant. 2 (port 2) could transmit/receive.

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

**1.1.3 Accessories**

Accessories				
AC Adapter (Source 1) (EU Plug) (US Plug) (AUS/NZ Plug) (UK Plug)	Brand Name	Tenpao	Model Name	S005BMM0500100
	Manufacturer	Ten Pao Electronics(Hulzhou) Co., Ltd		
	Power Rating	I/P: 100-240Vac, 50/60Hz, 0.3A, O/P: 5Vdc, 1.0A		
	Power Cord	1.5 meter, non-shielded cable, w/o ferrite core		
AC Adapter (Source 2) (EU Plug) (US Plug) (UK Plug) (AUS/NZ Plug)	Brand Name	PYS	Model Name	PYS-06VY050100
	Manufacturer	PYS High-Tech Co.LTD		
	Power Rating	I/P: 100-240Vac, 50/60Hz, 0.3A, O/P: 5Vdc, 1.0A		
	Power Cord	1.5 meter, non-shielded cable, w/o ferrite core		
RJ45 Cable	Signal Line	1.5 meter, non-shielded cable		

Reminder: Regarding to more detail and other information, please refer to user manual.

1.1.4 Table for Multiple Listing

Table for Explanation of SKU and 2nd Source

Object/part or Description (location)	Location	SKU 1	SKU 2	SKU 3	SKU 4
DDR4	U10	Brand: SK HYNIX Model: H5AG36EXNDX017	Brand: Samsung Model: K4A8G165WC-BCTD	Brand: NANYA Model: NT5AD512M16C4-JR	Brand: Micron Model: MT40A512M16TB-062E:R
eMMC	U21	Brand: KIOXIA Model: THGBMUG6C1LBAIL	Brand: KIOXIA Model: THGBMUG6C1LBAIL	Brand: SAMSUNG Model: KLM8G1GETF-B041	Brand: KIOXIA Model: THGBMUG6C1LBAIL
LAN transformer x1	T1	Brand: U-TRON Model: HSC-1607-R	Brand: GLGNET Model: GST16002HF	Brand: GLGNET Model: GST16002HF	Brand: GLGNET Model: GST16002HF
DC-DC buck x2	U4,U6	Brand: DIOO Model: DIO6012BCST5	Brand: DIOO Model: DIO6012BCST5	Brand: SILERGY Model: SY8089A1AAC	Brand: M3TEK Model: MT8152NSBR
DC-DC buck x2	U3,U5	Brand: SILERGY Model: SY8089E1AAC	Brand: JOULWATT Model: JW5262CFSOTA#TR	Brand: M3TEK Model: MT8152ASBR	Brand: RICHTEK Model: RT5752BHGJ5
LDO x3	U1,U11,U2	Brand: FITIPOWER Model: FP6186S5	Brand: ANPEC Model: APL5324ABI-TRG	Brand: FITIPOWER Model: FP6186S5	Brand: FITIPOWER Model: FP6186AS5
Adaptor	-	Brand: Tenpao Model: S005BMM0500100	Brand: PYS Model: PYS-06VY050100	-	-

From the above SKU, The SKU 1 was selected as representative model for the test and its data was recorded in this report. All SKUs were verified and SKU 1 was found to be the worst case.

1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 2 Subpart J, section 2.1091
- ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ 47 CFR Part 1.1307
- ♦ 47 CFR Part 1.1310

1.3 Testing Location

Test Lab. : Sporton International Inc. Hsinhua Laboratory			
☒	Hsinhua (TAF: 3785)	ADD: No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)	
		TEL: 886-3-327-3456	FAX: 886-3-327-0973
Test site Designation No. TW3785 with FCC.			
☐	Wen 33rd.St. (TAF: 3785)	ADD: No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)	
		TEL: 886-3-318-0787	FAX: 886-3-318-0287
Test site Designation No. TW0008 with FCC.			

2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f ²)*	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

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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

Note: f = frequency in MHz ; *Plane-wave equivalent power density

Multiple Transmitters Condition

Co-location as simultaneously transmitting (co-transmitting) and the evaluation shall be consider that simultaneous transmissions from co-located devices the individual transmitters are evaluated separately. After sum of the individual value (basic restriction / reference level) are measured/calculated also have to under basic restriction / reference level.

Co-transmitting mode: 1. 2.4GHz WLAN + Bluetooth + ZigBee
2. 5GHz WLAN + Bluetooth + ZigBee

2.2 RF Exposure Exempt Measurement

Option	Refer Std.	Exemption Exposure Thresholds (TL)
A	§1.1307(b)(3)(i)(A)	Available maximum time-averaged power is no more than 1 mW
B	§1.1307(b)(3)(i)(B)	$P_{th}(mW) = \begin{cases} ERP_{20cm} (d / 20cm)^x \rightarrow d \leq 20cm \\ ERP_{20cm} \rightarrow 20cm < d \leq 40cm \end{cases}$ $x = -\log_{10} \left(\frac{60}{ERP_{20cm} \sqrt{f}} \right) \text{ and } f \text{ is in GHz}$ $\begin{cases} ERP_{20cm} : 0.3GHz \leq f < 1.5GHz \rightarrow 2040 f(mW) \\ ERP_{20cm} : 1.5GHz \leq f \leq 6GHz \rightarrow 3060(mW) \end{cases}$
C	§1.1307(b)(3)(i)(C)	$\begin{cases} 0.3 \sim 1.34MHz \rightarrow ERP(W) = 1920R^2 \\ 1.34 \sim 30MHz \rightarrow ERP(W) = 3450R^2 / f^2 \\ 30 \sim 300MHz \rightarrow ERP(W) = 3.83R^2 \\ 300 \sim 1500MHz \rightarrow ERP(W) = 0.0128R^2 f \\ 1500 \sim 100000MHz \rightarrow ERP(W) = 19.2R^2 \end{cases}$ $f \text{ is in MHz; } R \text{ is in m; } R > \lambda / 2\pi$

2.3 Multiple RF Sources Exposure

Refer Std.	Exemption Exposure Thresholds (TL)
§1.1307(b)(3)(ii)(A)	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)
§1.1307(b)(3)(ii)(B)	$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k} \leq 1$ a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P , including existing exempt transmitters and those being added. b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(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 §1.1307(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 §1.1307(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. $Evaluated Limit_k$ = 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.

2.4 MPE Calculation Method

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:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

2.5 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

2.4GHz WLAN

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	2.70	23.20	23.75	0.50	266.073	20	B	3060.0	0.0870
2.4G;D1D	2.70	23.27	23.82	0.50	270.396	20	B	3060.0	0.0884

5GHz WLAN

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	2.80	20.17	20.82	0.50	135.519	20	B	3060.0	0.0443
5.3G;D1D	2.80	20.19	20.84	0.50	136.144	20	B	3060.0	0.0445
5.6G;D1D	2.80	19.07	19.72	0.50	105.196	20	B	3060.0	0.0344
5.8G;D1D	2.80	19.12	19.77	0.50	106.414	20	B	3060.0	0.0348

Bluetooth

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;BT-LE	2.70	11.40	11.95	0.50	17.579	20	B	3060.0	0.0057

ZigBee

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	2.80	9.90	10.55	0.50	12.735	20	B	3060.0	0.0042

Note 1: Option A, B and C refer as clause 2.2

Note 2: For option B, Pth(mW) convert to TL ERP(mW); For option C, ERP(W) convert to TL ERP(mW)

Note 3: TL Ratio=Tune-up ERP(mW)/TL ERP(mW)



Simultaneous Transmission Analysis Mode: 2.4GHz WLAN + Bluetooth + ZigBee

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	2.70	23.27	23.82	0.50	270.46	20.00	0.08825	1.00000	B	3060.000	0.0884
2.4G;BT-LE	2.70	11.40	11.95	0.50	17.58	20.00	0.00574	1.00000	B	3060.000	0.0057
2.4G;G1D	2.80	9.90	10.55	0.50	12.74	20.00	0.00416	1.00000	B	3060.000	0.0042
										Sum Ratio	0.09830
										Ratio Limit	1.00000

Simultaneous Transmission Analysis Mode: 5GHz WLAN + Bluetooth + ZigBee

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)	Option	TL ERP (mW)	TL Ratio
5.3G;D1D	2.80	20.19	20.84	0.50	136.18	20.00	0.04444	1.00000	B	3060.000	0.0445
2.4G;BT-LE	2.70	11.40	11.95	0.50	17.58	20.00	0.00574	1.00000	B	3060.000	0.0057
2.4G;G1D	2.80	9.90	10.55	0.50	12.74	20.00	0.00416	1.00000	B	3060.000	0.0042
										Sum Ratio	0.05441
										Ratio Limit	1.00000

Note 1: Option A, B and C refer as clause 2.2

Note 2: For option B, P_{th}(mW) convert to TL ERP(mW); For option C, ERP(W) convert to TL ERP(mW)

Note 3: TL Ratio=Tune-up ERP(mW)/TL ERP(mW)

Note 4: Refer as clause 2.3 Multiple RF Sources Exposure. Please follow below option and sum TL ration table.

Option	Sum TL Ratio_B	Option	Sum TL Ratio_C	Option	Sum TL Ratio_E
B	$\sum_{i=1}^a \frac{P_i}{P_{th,i}}$	C	$\sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}}$	E	$\sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k}$

Note: The above antenna gain was declared by manufacturer.

—————THE END—————