



Test report No:
2430175R-RF-US-P20V01

FCC EXPOSURE TEST REPORT

| | |
|--|---|
| Product Name | LED lamp |
| Trademark | PHILIPS hue  |
| Model and /or type reference | 9290034794 |
| FCC ID | 2AGBW9290034794AX |
| Applicant's name / address | Signify (China) Investment Co., Ltd No.9, Lane 888, Tian Lin Road, 200233, Shanghai, China |
| Test method requested, standard | FCC 47CFR §2.1091 |
| Verdict Summary | IN COMPLIANCE |
| Documented By (name / position & signature) | Jun Xu/ Project Engineer  |
| Approved by (name / position & signature) | Jack Zhang/ Manager  |
| Date of issue | 2024-05-24 |
| Report Version | V1.0 |
| Report template No | Template_FCC-MPE-RF-V1.0 |

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COMPETENCES AND GUARANTEES

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In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

| | |
|----------------------|--|
| Test Location | No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China |
| Date(receive sample) | Mar. 06, 2024 |
| Date (start test) | Apr. 08, 2024 |
| Date (finish test) | Apr. 26, 2024 |

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

| | |
|-----------------------|---------------|
| Ambient temperature | 15 °C – 35 °C |
| Relative Humidity air | 30% - 60% |

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

| | |
|---|-----------------|
| Test case does not apply to test object | N/A |
| Test object does meet requirement | P (Pass) / PASS |
| Test object does not meet requirement | F (Fail) / FAIL |
| Not measured | N/M |

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

| | |
|-------|-------------------------------|
| EUT | : Equipment Under Test |
| QP | : Quasi-Peak |
| CAV | : CISPR Average |
| AV | : Average |
| CDN | : Coupling Decoupling Network |
| SAC | : Semi-Anechoic Chamber |
| OATS | : Open Area Test Site |
| BW | : Bandwidth |
| AM | : Amplitude Modulation |
| PM | : Pulse Modulation |
| HCP | : Horizontal Coupling Plane |
| VCP | : Vertical Coupling Plane |
| U_N | : Nominal voltage |
| T_x | : Transmitter |
| R_x | : Receiver |
| N/A | : Not Applicable |
| N/M | : Not Measured |

DOCUMENT HISTORY

| Report No. | Version | Description | Issued Date |
|-----------------------|---------|--------------------------|-------------|
| 2430175R-RF-US-P20V01 | V1.0 | Initial issue of report. | 2024-05-24 |
| | | | |
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| | | | |

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC 47CFR §2.1091.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results relate only to the samples tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;

Note: The General Description of the Item , antenna information for the EUT in clause 1 are provided and confirmed by the client.

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

| | |
|-----------------------------|--|
| Product Name..... : | LED lamp |
| Model No. : | 9290034794 |
| Trademark. : | PHILIPS hue  |
| FCC ID : | 2AGBW9290034794AX |
| Manufacturer : | Signify (China) Investment Co., Ltd |
| Manufacturer Address..... : | No.9, Lane 888, Tian Lin Road, 200233, Shanghai, China |

| | | | | | | |
|--------------------------------|-------------------------------------|---------|-------------------------------------|---------|-------------------------------------|----------------|
| Wireless specification : | Bluetooth (LE) | | | | | |
| Operating frequency range(s) | 2402~2480MHz | | | | | |
| Type of Modulation : | GFSK | | | | | |
| PHYs..... : | <input checked="" type="checkbox"/> | LE 1M | <input checked="" type="checkbox"/> | LE 2M | <input checked="" type="checkbox"/> | LE Coded S=2/8 |
| Data Rate : | <input checked="" type="checkbox"/> | 1Mbit/s | <input checked="" type="checkbox"/> | 2Mbit/s | <input checked="" type="checkbox"/> | 500/125 Kbit/s |
| Number of channel..... : | 40 | | | | | |

| | | | | | | |
|--------------------------------|--------------|--|--|--|--|--|
| Wireless specification : | Zigbee | | | | | |
| Operating frequency range(s) | 2405~2480MHz | | | | | |
| Type of Modulation : | O-QPSK | | | | | |
| Data Rate : | 250kbps | | | | | |
| Number of channel..... : | 16 | | | | | |

| | | | | | | |
|----------------------------|-------------------------------------|--------------------------------|--|--|--|--|
| Rated power supply : | Voltage and Frequency | | | | | |
| | <input type="checkbox"/> | AC: 220 - 240 V, 50/60 Hz | | | | |
| | <input checked="" type="checkbox"/> | AC: 110 - 130 V, 50/60 Hz | | | | |
| | <input type="checkbox"/> | DC: 24 Vdc | | | | |
| | <input type="checkbox"/> | Poe: | | | | |
| | <input type="checkbox"/> | Adapter: | | | | |
| Mounting position..... : | <input type="checkbox"/> | Tabletop equipment | | | | |
| | <input checked="" type="checkbox"/> | Wall/Ceiling mounted equipment | | | | |
| | <input type="checkbox"/> | Floor standing equipment | | | | |
| | <input type="checkbox"/> | Hand-held/Portable equipment | | | | |
| | <input type="checkbox"/> | Other: | | | | |

1.2 Antenna Informaion

| | | | |
|-----------------------------------|-------------------------------------|---------------|---|
| Antenna model / type number | N/A | | |
| Antenna serial number | N/A | | |
| Antenna Delivery | <input checked="" type="checkbox"/> | 1TX + 1RX | |
| | <input type="checkbox"/> | 2TX + 2RX | |
| | <input type="checkbox"/> | Others: | |
| Antenna technology | <input checked="" type="checkbox"/> | SISO | |
| | <input type="checkbox"/> | MIMO | <input type="checkbox"/> CDD |
| | | | <input type="checkbox"/> Beam-forming |
| Antenna Type | <input type="checkbox"/> | External | <input type="checkbox"/> Dipole |
| | | | <input type="checkbox"/> Sectorized |
| | | | <input type="checkbox"/> Ceramic Chip |
| | <input checked="" type="checkbox"/> | Internal | <input type="checkbox"/> PIFA |
| | | | <input checked="" type="checkbox"/> PCB |
| | | | <input type="checkbox"/> Others..... |
| Antenna Gain..... | 2.5dBi | | |

2. RF Exposure Evaluation

2.1. Limits: KDB 447498 D04

B.2 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.

B.3 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.

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 | $19.2R^2$ |

Subscripts L and H are low and high; λ is wavelength.
 From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

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.

For mobile devices that are not exempt per Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{\text{th}} \text{ (mW)} = \text{ERP}_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only 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.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

B.4 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 0.5 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 ERP20cm 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 |

Simultaneous Transmission SAR Test Exemption with Respect to Multiple Exemption Criteria

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 according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

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

- a. number of fixed, mobile, or portable RF sources claiming exemption using the § 1.1307(b)(3)(i)(B) formula for Pth, including existing exempt transmitters and those being added.
- b. number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula 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.

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 (Pth) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i.

ERP_j . the available maximum time-averaged power or the ERP, whichever is greater, 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 § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

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.

Exposure

Limit $_k$. either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

2.3. Test Result of RF Exposure Evaluation

| | | |
|-----------|---|------------------------|
| Product | : | LED lamp |
| Test Item | : | RF Exposure Evaluation |
| Test Site | : | AC-6 |

The tune-up power is 1dB, so the maximum conducted we used to calculate RF exposure is 10.34 dBm for Bluetooth and 10.43 dBm for Zigbee.

B.2 Blanket 1 mW Blanket Exemption

| Test Mode | Frequency Band (MHz) | Maximum conducted Power (dBm) | Maximum ERP Power (dBm) | Maximum Power (mW) | Limit (mW) | Result |
|-----------|----------------------|-------------------------------|-------------------------|--------------------|------------|----------------|
| 2.4G BT | 2402 ~ 2480 | 8.24 | 10.74 | 11.86 | 1 | Not applicable |
| Zigbee | 2405 ~ 2480 | 8.25 | 10.75 | 11.87 | 1 | Not applicable |

Note: BLE & Zigbee does not comply with B.2 Blanket 1 mW Blanket Exemption, we use B.3 MPE-based Exemption for evaluation.

B.3 MPE-based Exemption

| Test Mode | Frequency Band (MHz) | Maximum conducted Power (dBm) | Maximum ERP Power (dBm) | Maximum Power (mW) | R (cm) | Limit (mW) | Result |
|-----------|----------------------|-------------------------------|-------------------------|--------------------|--------|------------|--------|
| 2.4G BT | 2402 ~ 2480 | 8.24 | 10.74 | 11.86 | 20 | 768 | Pass |
| Zigbee | 2405 ~ 2480 | 8.25 | 10.75 | 11.87 | 20 | 768 | Pass |

Note: So the safe use distance of the EUT is 20cm, without any other radio equipment.

_____ The End _____