



RADIO EXPOSURE TEST REPORT

FCC ID : Z8H89FT0077
Equipment : XV2-22H Wallplate Wi-Fi 6 Access Point
Brand Name : Cambium Networks
Model Name : XV2-22H
Applicant : Cambium Networks Inc.
3800 Golf Road, Suite 360 Rolling Meadows, IL
60008, USA
Manufacturer : Cambium Networks, Ltd.
Ashburton, TQ13 7UP, UK
Standard : 47 CFR Part 2.1091

The product was received on Jul. 01, 2022, and testing was started from Jul. 07, 2022 and completed on Aug. 02, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 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. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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Summary of Test Result

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

Declaration of Conformity:

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

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.

Reviewed by: **Sam Chen**

Report Producer: **Penny Kao**



1 General Description

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) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) |
| 5GHz WLAN | 5150-5250 5725-5850 | 5180-5240 5745-5825 | 802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) |
| Bluetooth | 2400-2483.5 | 2402-2480 | LE: GFSK |
| IEEE802.15.4 | 2400-2483.5 | 2405-2480 | O-QPSK |



1.2 Antenna Information

| Ant. | Port | | | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|------|-------------|-----------|--------------------|--------|------------|--------------|-----------|------------|
| | WLAN 2.4GHz | WLAN 5GHz | Bluetooth / Zigbee | | | | | |
| 1 | 1 | - | - | Gemtek | WRTQ-372AX | PIFA | I-Pex | Note1 |
| 2 | 2 | - | - | Gemtek | WRTQ-372AX | PIFA | I-Pex | |
| 3 | - | 2 | - | Gemtek | WRTQ-372AX | PIFA | I-Pex | |
| 4 | - | 1 | - | Gemtek | WRTQ-372AX | PIFA | I-Pex | |
| 5 | - | - | 1 | Gemtek | WRTQ-372AX | Dipole | I-Pex | |

Note1: Antenna Gain information

| Ant. | Port | | | Antenna Gain (dBi) | | | |
|------|-------------|-----------|--------------------|--------------------|-----------|--------|--------------------|
| | WLAN 2.4GHz | WLAN 5GHz | Bluetooth / Zigbee | WLAN 2.4GHz | WLAN 5GHz | | Bluetooth / Zigbee |
| | | | | | UNII 1 | UNII 3 | |
| 1 | 1 | - | - | 4.47 | - | - | - |
| 2 | 2 | - | - | 4.42 | - | - | - |
| 3 | - | 2 | - | - | 5.56 | 5.48 | - |
| 4 | - | 1 | - | - | 5.45 | 5.51 | - |
| 5 | - | - | 1 | - | - | - | 5.18 |

Note 2: Directional gain information

| Type | Maximum Output Power | Power Spectral Density |
|--------|---|--|
| Non-BF | Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4 | $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ |
| BF | $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ | $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ |

Ex.

Directional Gain (NSS1) formula :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

$$N_{SS1}(g1,1) = 10^{G1/20} ; N_{SS1}(g1,2) = 10^{G2/20} ;$$

$$g_{j,k} = (N_{SS1}(g1,1) + N_{SS1}(g1,2))^2$$

$$DG = 10 \log \left[\frac{(N_{SS1}(g1,1) + N_{SS1}(g1,2))^2}{N_{ANT}} \right] \Rightarrow 10 \log \left[\frac{(10^{G1/20} + 10^{G2/20})^2}{N_{ANT}} \right]$$

Where ;

$$G1 = 10 ; G2 = 10 ;$$

$$2.4G \ G1 = 4.47 \text{ dBi} ; G2 = 4.42 \text{ dBi} ; DG = 7.46 \text{ dBi}$$

$$5G \text{ Band1} \ G1 = 5.56 \text{ dBi} ; G2 = 5.45 \text{ dBi} ; DG = 8.52 \text{ dBi}$$

$$5G \text{ Band4} \ G1 = 5.48 \text{ dBi} ; G2 = 5.51 \text{ dBi} ; DG = 8.51 \text{ dBi}$$



Note 3: The above information was declared by manufacturer.

Note 4: The EUT has five antennas.

<WLAN 2.4GHz Function>

IEEE 802.11b/g/n/VHT/ax (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

<WLAN 5GHz Function>

IEEE 802.11a/n/ac/ax (2TX/2RX):

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

<Bluetooth/Zigbee function>

Bluetooth/Zigbee (1TX/1RX):

Port 1 can be used as transmitting/receiving antenna.

1.3 Accessories

| Others |
|-----------------------------------|
| RJ-45 cable*1: Non-shielded, 0.1m |
| Wall-mounted rack*1 |

1.4 Table for EUT supports functions

| Function |
|----------|
| AP |
| Bridge |
| Mesh |

Note: The above information was declared by manufacturer.

1.5 Applicable Standards

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

- ♦ 47 CFR Part 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

1.6 Testing Location

| Testing Location Information | |
|---|--|
| Test Lab. : Sporton International Inc. Hsinchu Laboratory | |
| Hsinchu | ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) |
| (TAF: 3787) | TEL: 886-3-656-9065 FAX: 886-3-656-9085 |
| | Test site Designation No. TW3787 with FCC. |
| | Conformity Assessment Body Identifier (CABID) TW3787 with ISED. |



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

2.2 MPE Calculation Method

The MPE was calculated at 41 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

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

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



2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= Pth.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance R between the person and the antenna / radiating structure, where $R > \lambda / 2 \pi$.

| Single RF Sources Subject to Routine Environmental Evaluation | |
|---|--|
| RF Source frequency (MHz) | Threshold ERP (watts) |
| 0.3-1.34 | 1,920 R ² . |
| 1.34-30 | 3,450 R ² /f ² . |
| 30-300 | 3.83 R ² . |
| 300-1,500 | 0.0128 R ² f. |
| 1,500-100,000 | 19.2R ² . |

Note: R is in meters, f is in MHz.



2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

| Mode | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up EIRP (dBm) | Tune-up EIRP (W) | Distance (cm) | S (mW/cm ²) | S Limit (mW/cm ²) |
|--------------|----------|-------------|------------|----------------|--------------------|------------------|---------------|-------------------------|-------------------------------|
| 2.4G;D1D | 7.46 | 26.17 | 33.63 | 0.50 | 34.13 | 2.58821 | 41 | 0.12252 | 1.00000 |
| 5.2G;D1D | 8.52 | 24.30 | 32.82 | 0.50 | 33.32 | 2.14783 | 41 | 0.10167 | 1.00000 |
| 5.8G;D1D | 8.51 | 24.51 | 33.02 | 0.50 | 33.52 | 2.24905 | 41 | 0.10647 | 1.00000 |
| 2.4G;BT-LE | 5.18 | 18.44 | 23.62 | 0.50 | 24.12 | 0.25823 | 41 | 0.01222 | 1.00000 |
| 2.4G; Zigbee | 5.18 | 18.19 | 23.37 | 0.50 | 23.87 | 0.24378 | 41 | 0.01154 | 1.00000 |

| MPE Exemption Option C | | | | | | | |
|------------------------|--------------------|-------|--------------------|-------------------|-----------------|-------------------|---------------|
| Frequency (MHz) | $\lambda/2\pi$ (m) | R (m) | Tune-up EIRP (dBm) | Tune-up ERP (dBm) | Tune-up ERP (W) | ERP Threshold (W) | MPE Exemption |
| 2437 | 0.0196 | 0.41 | 34.13 | 31.98 | 1.578 | 3.228 | Complies |
| 5825 | 0.0082 | | 33.52 | 31.37 | 1.371 | 3.228 | Complies |
| 2440(BT) | 0.0196 | | 24.12 | 21.97 | 0.157 | 3.228 | Complies |
| 2440(Zigbee) | 0.0196 | | 23.87 | 21.72 | 0.149 | 3.228 | Complies |

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+WLAN 5GHz+Bluetooth

| Simultaneous Transmissions Option C | | | | | | | |
|-------------------------------------|-------|--------------------|-------------------|-----------------|-------------------|----------------------------|----------------------------------|
| Frequency (MHz) | R (m) | Tune-up EIRP (dBm) | Tune-up ERP (dBm) | Tune-up ERP (W) | ERP Threshold (W) | Simultaneous Transmissions | Simultaneous Transmissions Limit |
| 2437 | 0.41 | 34.13 | 31.98 | 1.578 | 3.228 | 0.96 | <= 1 |
| 5825 | | 33.52 | 31.37 | 1.371 | 3.228 | | |
| 2440 | | 24.12 | 21.97 | 0.157 | 3.228 | | |

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+WLAN 5GHz+Zigbee

| Simultaneous Transmissions Option C | | | | | | | |
|-------------------------------------|-------|--------------------|-------------------|-----------------|-------------------|----------------------------|----------------------------------|
| Frequency (MHz) | R (m) | Tune-up EIRP (dBm) | Tune-up ERP (dBm) | Tune-up ERP (W) | ERP Threshold (W) | Simultaneous Transmissions | Simultaneous Transmissions Limit |
| 2437 | 0.41 | 34.13 | 31.98 | 1.578 | 3.228 | 0.96 | <= 1 |
| 5825 | | 33.52 | 31.37 | 1.371 | 3.228 | | |
| 2440 | | 23.87 | 21.72 | 0.149 | 3.228 | | |

Note: The above antenna gain was declared by manufacturer.

————THE END————