



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240300042002

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1 Cover Page

RF Exposure Evaluation Report

Application No.: KSCR2403000420AT
FCC ID: 2AL8S-0235C8PA
Applicant: Zhejiang Uniview Technologies Co., Ltd.
Address of Applicant: No. 369, Xietong Road, Xixing Sub-district, Binjiang District, Hangzhou City, 310051, Zhejiang Province, China
Manufacturer: Zhejiang Uniview Technologies Co., Ltd.
Address of Manufacturer: No. 369, Xietong Road, Xixing Sub-district, Binjiang District, Hangzhou City, 310051, Zhejiang Province, China
Factory: Zhejiang Uniview System Technology Co., Ltd.
Address of Factory: No.1277 Qingfeng South Road (South) , Tongxiang Economic Development Zone, Tongxiang City, Jiaxing City, 314500, Zhejiang, China

Equipment Under Test (EUT):
EUT Name: UNV-Link Pro Connect Box
GCB01-B7,GCBxxxx-yyyy-zzzz("x" can be 0-9, A-Z, a-z or blank, denoting difference in interface,"y" can be 0-9,A-Z,a-z or blank, denoting difference in interface,"z" can be 0-9,A-Z,a-z or blank, denoting difference in interface,"-" may be blank)
Model No.:

Standard(s) : FCC Rules 47 CFR §2.1091
KDB 447498 D04 interim General RF Exposure Guidance v01

Date of Receipt: 2024-03-15
Date of Test: 2024-04-01 to 2024-04-10
Date of Issue: 2024-04-17

| | |
|---------------------|--------------|
| Test Result: | Pass* |
|---------------------|--------------|

* In the configuration tested, the EUT complied with the standards specified above.

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| Revision Record | | | |
|-----------------|-------------|------------|--------|
| Version | Description | Date | Remark |
| 00 | Original | 2024-04-17 | / |
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| | | | |
|--------------------------|--|----------------------------------|--|
| Authorized for issue by: | | | |
| Tested By | | <i>Maker Qi</i> | |
| | | <hr/> Maker_Qi /Project Engineer | |
| Approved By | | <i>Terry Hou</i> | |
| | | <hr/> Terry Hou /Reviewer | |



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3 General Information

3.1 General Description of E.U.T.

| | |
|---------------|--------------------------------|
| Power supply: | 12Vdc-1A max; PoE48V-0.25A max |
|---------------|--------------------------------|

3.2 Details of E.U.T.

2.4G 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: | PCB antenna |
| Antenna Gain: | Antenna 1:0.51dBi (Provided by manufacturer) Antenna 2: 0.16dBi (Provided by manufacturer) Directional gain:3.35dBi |

3.3 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. internal working 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.

3.4 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 FCC Radiofrequency radiation exposure limits

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

4.1 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.

4.2 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.

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 ² f |
| 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); also in §1.1307(b)(1)(i)(B)].

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

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.

| Limit calculation | | | |
|-------------------|----------------|------------------------|------------------|
| Frequency range | Frequency(MHz) | R($\lambda/2\pi$)(m) | Threshold ERP(W) |
| 300~1500MHz | 915 | 0.0522 | 0.032 |
| 1500~100000MHz | 2462 | 0.0194 | 0.007 |

4.3 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 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

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



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and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

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 |

For 2.4G WiFi

| Limit calculation | | | | |
|----------------------|----------------|-------|--------------|-----------------|
| Frequency range(GHz) | Frequency(GHz) | X | Distance(cm) | Pth (mW) |
| 1.5~6 | 2.462 | 1.903 | 20 | 3060.000 |
| | | | | |



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5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report KSCR240300042001

| Test Mode | Channel | Antenna 1 Power[dBm] | Antenna 2 Power[dBm] | MIMO Power[dBm] | Antenna 1 Power[mW] | Antenna 2 Power[mW] | MIMO Power[mW] |
|-----------|---------|----------------------|----------------------|-----------------|---------------------|---------------------|----------------|
| 11B | 2412 | 6.52 | 5.81 | NA | 4.49 | 3.81 | N/A |
| 11B | 2437 | 6.09 | 4.68 | NA | 4.06 | 2.94 | N/A |
| 11B | 2462 | 6.95 | 6.22 | NA | 4.95 | 4.19 | N/A |
| 11G | 2412 | 15.89 | 16.08 | NA | 38.82 | 40.55 | N/A |
| 11G | 2437 | 16.09 | 15.73 | NA | 40.64 | 37.41 | N/A |
| 11G | 2462 | 16.98 | 15.80 | NA | 49.89 | 38.02 | N/A |
| 11N20MIMO | 2412 | 15.04 | 15.02 | 18.04 | 31.92 | 31.77 | 63.68 |
| 11N20MIMO | 2437 | 14.72 | 14.72 | 17.73 | 29.65 | 29.65 | 59.29 |
| 11N20MIMO | 2462 | 15.85 | 15.29 | 18.59 | 38.46 | 33.81 | 72.28 |
| 11N40MIMO | 2422 | 15.07 | 15.36 | 18.23 | 32.14 | 34.36 | 66.53 |
| 11N40MIMO | 2437 | 14.94 | 15.15 | 18.06 | 31.19 | 32.73 | 63.97 |
| 11N40MIMO | 2452 | 14.86 | 14.98 | 17.93 | 30.62 | 31.48 | 62.09 |



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5.2 RF Exposure Calculation

The Max Conducted Peak Output Power is 49.89 mW for antenna1, 40.55 mW for antenna2. The best case gain of the antenna is 0.51dBi for antenna1 and 0.16dBi for antenna2.

0.51dBi logarithmic terms convert to numeric result is nearly 1.12.

0.16dBi logarithmic terms convert to numeric result is nearly 1.04.

3.35dBi logarithmic terms convert to numeric result is nearly 2.16.

According to the formula. calculate the EIRP test result:

Antenna1: $EIRP = P \times G = 49.89 \text{ mW} \times 1.12 = 55.877\text{mW}$

Antenna2: $EIRP = P \times G = 40.55 \text{ mW} \times 1.04 = 42.172\text{mW}$

In MIMO mode: $EIRP = P \times G = 72.28\text{mW} \times 2.16 = 156.125\text{mW}$

Remark: we used the maximum power between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

| | Evaluation method | Exempt Limit(mW) | Verdict |
|-------------------------------------|---------------------------------|---------------------------|---------|
| <input type="checkbox"/> | Blanket 1 mW Blanket Exemption | 1mW | N/A |
| <input type="checkbox"/> | MPE-based Exemption(ERP) | 7mW(ERP) (2.4GHz Band) | N/A |
| <input checked="" type="checkbox"/> | SAR-based Exemption(P_{th}) | 3060mW(ERP) (1.5GHz~6GHz) | Yes |

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report

--End of the Report--