

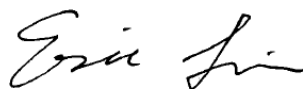
1 Cover Page

RF Exposure Evaluation Report

Application No.: KSCR2210001892AT
FCC ID: SVNIPC-C46EIN
Applicant: ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.
Address of Applicant: No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China
Manufacturer: ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.
Address of Manufacturer: No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China
Equipment Under Test (EUT):
EUT Name: 4MP Spotlight WIFI Camera
Model No.: C46EIN,DH-IPC-C46EI-USA,DH-C46EI-CAN,DH-C46EI,DH-C46EI,IPC-C46EI-USA,IPC-C46EI-CAN, IPC-C46EI,C46EI
Standard(s) : FCC Rules 47 CFR §2.1091
Date of Receipt: KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt: 2022-10-10
Date of Test: 2022-10-15 to 2022-10-19
Date of Issue: 2022-10-24

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.


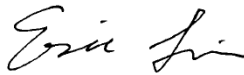


Eric Lin
Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2022-10-24		Original

Authorized for issue by:			
			
		Eric_Liu /Project Engineer	
			
		Eric Lin/Reviewer	



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3 General Information

3.1 General Description of E.U.T.

Test power:	AC 120V/60Hz
S/N:	8M0024EPAG45216
Firmware Version:	V2.820.0000000.18.R

3.2 Details of E.U.T.

2.G 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:	Ant 1: FPC Antenna Ant 2: FPC Antenna
Antenna Gain:	Ant 1: 4.17dBi(Provided by the manufacturer) Ant 2: 4.54dBi(Provided by the manufacturer) Directional gain:7.37dBi



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5G

Operation Frequency (20MHz):	U-NII-1: 5180-5240MHz; U-NII-2A: 5260-5320MHz; U-NII-2C: 5500-5700MHz; U-NII-3: 5745-5825MHz
Operation Frequency (40MHz):	U-NII-1: 5190-5230MHz; U-NII-2A: 5270-5310MHz; U-NII-2C: 5510-5670MHz; U-NII-3: 5755-5795MHz
Operation Frequency (80MHz):	U-NII-1: 5210MHz; U-NII-2A: 5290MHz; U-NII-2C: 5530-5610MHz; U-NII-3: 5775MHz
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Spacing:	802.11a/n(HT20)/ac(HT20): 20MHz; 802.11n(HT40)/ac(HT40): 40MHz; 802.11ac(HT80): 80MHz
DFS Function:	Slave without Radar detection
TPC Function:	Without TPC function
Antenna Type:	Ant 1: FPC Antenna Ant 2: FPC Antenna
Antenna Gain:	For U-NII-1 Antenna 1:2.03dBi(Provided by the manufacturer) Antenna 2:4.16dBi (Provided by the manufacturer) Directional gain:6.23dBi For U-NII-2A Antenna 1:4.00dBi(Provided by the manufacturer) Antenna 2:4.08dBi (Provided by the manufacturer) Directional gain:7.05dBi For U-NII-2C Antenna 1:4.44dBi(Provided by the manufacturer) Antenna 2:3.21dBi (Provided by the manufacturer) Directional gain:6.88dBi For U-NII-3 Antenna 1:2.24dBi Antenna(Provided by the manufacturer) Antenna 2:6.81dBi(Provided by the manufacturer) Directional gain:8.11dBi



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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. clock frequency, highest internal 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).

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L4354)

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 2541.01)

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC (Designation Number: CN1172)

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory.

Designation Number: CN1172.

• ISED (CAB identifier: CN0072)

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 (Member No.: 1938)

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.



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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



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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.



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Compliance Certification Services (Kunshan) Inc.

Report No.: KSCR221000189204

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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

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

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



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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

For 5G WiFi

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	Distance(cm)	Pth (mW)
1.5~6	5.825	2.090	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 KSCR221000189201, KSCR221000189202

2.4G WiFi

Test Mode	Test Frequency (MHz)	Antenna 1 Power (dBm)	Antenna 2 Power (dBm)	MIMO Power (dBm)	Antenna 1 Power (mW)	Antenna 2 Power (mW)	MIMO Power (mW)
11B	2412	11.52	12.77	/	14.19	18.92	/
	2437	11.18	12.61	/	13.12	18.24	/
	2462	11.46	12.99	/	14.00	19.91	/
11G	2412	7.74	8.91	/	5.94	7.78	/
	2437	11.16	12.61	/	13.06	18.24	/
	2462	8.57	10.07	/	7.19	10.16	/
11N20MIMO	2412	5.88	6.93	9.45	3.87	4.93	8.81
	2437	8.81	10.29	12.62	7.60	10.69	18.28
	2462	5.16	6.79	9.06	3.28	4.78	8.05
11N40MIMO	2422	5.15	6.36	8.81	3.27	4.33	7.60
	2437	7.54	9.01	11.35	5.68	7.96	13.65
	2452	5.10	6.68	8.97	3.24	4.66	7.89



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5G WiFi

Test Mode	Test Frequency (MHz)	Antenna 1 Power (dBm)	Antenna 2 Power (dBm)	MIMO Power (dBm)	Antenna 1 Power (mW)	Antenna 2 Power (mW)	MIMO Power (mW)
11A	5180	10.85	10.63	/	12.16	11.56	/
	5200	10.87	10.94	/	12.22	12.42	/
	5240	10.98	10.74	/	12.53	11.86	/
	5260	10.71	10.70	/	11.78	11.75	/
	5300	11.06	10.77	/	12.76	11.94	/
	5320	10.76	11.16	/	11.91	13.06	/
	5500	10.86	11.05	/	12.19	12.74	/
	5580	10.84	10.77	/	12.13	11.94	/
	5700	10.85	11.02	/	12.16	12.65	/
	5745	10.91	11.02	/	12.33	12.65	/
	5785	11.10	11.11	/	12.88	12.91	/
	5825	10.95	10.98	/	12.45	12.53	/
11N20 MIMO	5180	11.30	11.06	14.19	13.49	12.76	26.24
	5200	11.10	10.80	13.96	12.88	12.02	24.89
	5240	11.04	10.77	13.92	12.71	11.94	24.66
	5260	10.79	10.74	13.78	11.99	11.86	23.88
	5300	10.78	9.88	13.36	11.97	9.73	21.68
	5320	10.79	10.15	13.49	11.99	10.35	22.34
	5500	10.95	11.10	14.04	12.45	12.88	25.35
	5580	10.79	10.67	13.74	11.99	11.67	23.66
	5700	11.23	10.02	13.68	13.27	10.05	23.33
	5745	9.82	8.96	12.42	9.59	7.87	17.46
	5785	10.36	9.22	12.84	10.86	8.36	19.23
	5825	10.32	9.31	12.85	10.76	8.53	19.28
11N40 MIMO	5190	10.03	9.70	12.88	10.07	9.33	19.41
	5230	10.16	10.06	13.12	10.38	10.14	20.51
	5270	10.03	9.71	12.88	10.07	9.35	19.41
	5310	9.94	9.70	12.83	9.86	9.33	19.19
	5510	9.99	9.90	12.96	9.98	9.77	19.77
	5550	9.94	9.85	12.91	9.86	9.66	19.54



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	5670	9.84	9.83	12.85	9.64	9.62	19.28	
	5755	10.19	9.93	13.07	10.45	9.84	20.28	
	5795	9.61	9.61	12.62	9.14	9.14	18.28	
11AC20 MIMO	5180	11.06	10.92	14.00	12.76	12.36	25.12	
	5200	10.90	10.71	13.82	12.30	11.78	24.10	
	5240	10.96	9.99	13.51	12.47	9.98	22.44	
	5260	10.81	9.61	13.26	12.05	9.14	21.18	
	5300	11.12	8.55	13.03	12.94	7.16	20.09	
	5320	10.98	8.81	13.04	12.53	7.60	20.14	
	5500	10.98	11.23	14.12	12.53	13.27	25.82	
	5580	10.70	10.63	13.68	11.75	11.56	23.33	
	5700	10.44	8.61	12.63	11.07	7.26	18.32	
	5745	9.72	8.40	12.12	9.38	6.92	16.29	
	5785	10.07	8.54	12.38	10.16	7.14	17.30	
	5825	10.40	8.75	12.66	10.96	7.50	18.45	
	11AC40 MIMO	5190	10.09	9.88	13.00	10.21	9.73	19.95
		5230	9.82	9.94	12.89	9.59	9.86	19.45
5270		9.87	9.69	12.79	9.71	9.31	19.01	
5310		10.11	9.02	12.61	10.26	7.98	18.24	
5510		9.81	10.02	12.93	9.57	10.05	19.63	
5550		10.13	10.02	13.09	10.30	10.05	20.37	
5670		10.16	9.76	12.97	10.38	9.46	19.82	
5755		9.96	9.13	12.58	9.91	8.18	18.11	
5795	10.10	9.27	12.72	10.23	8.45	18.71		
11AC80 MIMO	5210	9.02	9.22	12.13	7.98	8.36	16.33	
	5290	9.02	9.10	12.07	7.98	8.13	16.11	
	5530	8.88	10.03	12.50	7.73	10.07	17.78	
	5610	9.11	8.92	12.03	8.15	7.80	15.96	
	5775	9.15	9.19	12.18	8.22	8.30	16.52	



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5.2 RF Exposure Calculation

For FCC:

2.4G WiFi

The Max Conducted Peak Output Power is 14.19 mW for antenna1, 19.91mW for antenna2, 18.28 mW for Mimo.

The best case gain of the antenna is 4.17dBi for antenna1 and 4.54dBi for antenna2.

Directional gain:7.37dBi.

4.17dBi logarithmic terms convert to numeric result is nearly 2.61.

5.54dBi logarithmic terms convert to numeric result is nearly 2.84.

7.37dBi logarithmic terms convert to numeric result is nearly 5.46.

According to the formula. calculate the EIRP test result:

Antenna1: $EIRP = P \times G = 14.19 \text{ mW} \times 2.61 = 37.03\text{mW}$

Antenna2: $EIRP = P \times G = 19.91 \text{ mW} \times 2.84 = 56.54\text{mW}$

In MIMO mode: $EIRP = P \times G = 18.28 \text{ mW} \times 5.46 = 99.81\text{mW}$

5G WiFi

The Max Conducted Peak Output Power is 13.49 mW for antenna1, 13.27 mW for antenna2, 26.24mW for Mimo.

For U-NII-1 The best case gain of the antenna is 2.03dBi for antenna1 and 4.16dBi for antenna2.

Directional gain:6.23dBi.

For U-NII-2A The best case gain of the antenna is 4.00dBi for antenna1 and 4.08dBi for antenna2.

Directional gain:7.05dBi

For U-NII-2C The best case gain of the antenna is 4.44dBi for antenna1 and 3.21dBi for antenna2.

Directional gain:6.88dBi

For U-NII-3 The best case gain of the antenna is 2.24dBi for antenna1 and 6.81dBi for antenna2.

Directional gain:8.11dBi

2.03dBi logarithmic terms convert to numeric result is nearly 1.60.

4.16dBi logarithmic terms convert to numeric result is nearly 2.61.

4.00dBi logarithmic terms convert to numeric result is nearly 2.51.

4.08dBi logarithmic terms convert to numeric result is nearly 2.56.

4.44dBi logarithmic terms convert to numeric result is nearly 2.78.

3.21dBi logarithmic terms convert to numeric result is nearly 2.09.

2.24dBi logarithmic terms convert to numeric result is nearly 1.67.

6.81dBi logarithmic terms convert to numeric result is nearly 4.80.

6.23dBi logarithmic terms convert to numeric result is nearly 4.20.

7.05dBi logarithmic terms convert to numeric result is nearly 5.07.



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6.88dBi logarithmic terms convert to numeric result is nearly 4.88.

8.11dBi logarithmic terms convert to numeric result is nearly 6.47.

According to the formula. calculate the EIRP test result:

Antenna1: $EIRP = P \times G = 13.49 \text{ mW} \times 2.78 = 37.50 \text{ mW}$

Antenna2: $EIRP = P \times G = 13.27 \text{ mW} \times 4.80 = 63.70 \text{ mW}$

In MIMO mode: $EIRP = P \times G = 26.24 \text{ mW} \times 6.47 = 169.77 \text{ mW}$

The 2.4GHz WiFi and 5GHz WiFi can transmit simultaneously, but the maximum rate of MPE is $99.81/3060 + 169.77/3060 = 0.0881 \leq 1$.

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--



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