

Radio Exposure Evaluation Report

Contains FCC ID : 2AXJ4WN725N / U2BRL039AT9S
FCC ID : 2ASW5PR050VD0
Equipment : SunCleanBots
Brand Name : AUO
Model Name : PR050VD0
Applicant : AUO Corporation
No.1, Li-Hsin Road 2, Hsinchu Science Park, Hsinchu
City, Taiwan
Manufacturer : AUO Corporation
No. 1, JhongKe Rd., Central Taiwan Science Park,
Taichung 407723, Taiwan, R.O.C.
Standard : 47 CFR FCC Part 2 Subpart J, section 2.1091

The product was received on Feb. 22, 2024, and testing was started from Mar. 06, 2024 and completed on Mar. 06, 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

SPORTON INTERNATIONAL INC. Hsinhua Laboratory
No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)



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Photographs of EUT V01



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: Terry Chang

Report Producer: Michelle Tsai

1 General Description

1.1 Information

1.1.1 EUT General Information

RF General Information		
Evaluation Mode	Frequency Range (MHz)	Modulation Type
LTE Band 2	1850 - 1910	LTE: QPSK / 16QAM / 64QAM
LTE Band 4	1710 - 1755	
LTE Band 5	824 - 849	
LTE Band 12	699 - 716	
LTE Band 66	1710 - 1780	

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	Molex	2079019100	Flexible Antenna	I-PEX

Ant.	Port	Gain (dBi)				
		Band 2	Band 4	Band 5	Band 12	Band 66
1	1	4.9	4.9	2.6	2.6	4.9

For WWAN function:

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

1.1.3 Accessories

Accessories				
Switching Power supply	Brand Name	MEAN WELL Enterprises Co., Ltd	Model Name	ENC-240-24
	Power Rating	I/P: 100-240Vac, 2.8A 50/60 Hz, O/P: 27.6Vdc, 8A		
	Power Cord	0.82 meter, shielded cable, w/o ferrite core		
AC Power Cable	-	1.8 meter, non-shielded cable		
Battery	Brand Name	TAIWAN HSINYU ENTERPRISE LTD.	Model Name	LR2170SD-7S5P
	Power Rating	25.2Vdc,25000mAh	Type	Li-ion
Brush	Brand Name	AUO	Model Name	PR050VD0 Brush
Remote Control	Brand Name	Radiolink	Model Name	AT9S Pro
White light	Brand Name	Litsource	Model Name	L020W

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



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		
<input checked="" type="checkbox"/>	Hsinhua (TAF: 3785)	ADD: No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.) TEL: 886-3-327-3456 (TAF: 3785)
Test site Designation No. TW3785 with FCC.		
<input type="checkbox"/>	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 (TAF: 3785)
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: 2.4GHz WLAN + LTE

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)	$P_{th}(mW) = \begin{cases} ERP_{20cm} (d / 20cm)^x \rightarrow d \leq 20cm \\ ERP_{20cm} \rightarrow 20cm < d \leq 40cm \end{cases}$ $x = -\log_{10} \left(\frac{60}{ERP_{20cm} \sqrt{f}} \right) \text{ and } f \text{ is in GHz}$ $\begin{cases} ERP_{20cm} : 0.3GHz \leq f < 1.5GHz \rightarrow 2040f(mW) \\ ERP_{20cm} : 1.5GHz \leq f \leq 6GHz \rightarrow 3060(mW) \end{cases}$
C	§1.1307(b)(3)(i)(C)	$\begin{cases} 0.3 \sim 1.34MHz \rightarrow ERP(W) = 1920R^2 \\ 1.34 \sim 30MHz \rightarrow ERP(W) = 3450R^2 / f^2 \\ 30 \sim 300MHz \rightarrow ERP(W) = 3.83R^2 \\ 300 \sim 1500MHz \rightarrow ERP(W) = 0.0128R^2 f \\ 1500 \sim 100000MHz \rightarrow ERP(W) = 19.2R^2 \end{cases}$ <p>f is in MHz; R is in m; $R > \lambda / 2\pi$</p>



2.3 Multiple RF Sources Exposure

Refer Std.	Exemption Exposure Thresholds (TL)
§1.1307(b)(3)(ii)(A)	<p>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)</p>
§1.1307(b)(3)(ii)(B)	$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k} \leq 1$ <p>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.</p> <p>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.</p> <p>c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.</p> <p>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> <p>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.</p> <p>ERP_j = the ERP of fixed, mobile, or portable RF source j.</p> <p>ERP_{th,j} = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.</p> <p>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.</p> <p>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.</p>



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:

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

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

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



2.5 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

WLAN 2.4GHZ

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;G1D;	-0.50	20.10	19.60	0.50	62.3893	20.00	0.02036	1.00000	B	3060.000	0.0204
2.4G;D1D;	-0.50	23.80	23.30	0.50	146.2548	20.00	0.04772	1.00000	B	3060.000	0.0478

LTE

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;G7D	4.9	23.00	27.90	0.50	421.8033	20.00	0.13764	1.00000	B	3060.000	0.1378
2;W7D	4.9	22.74	27.64	0.50	397.2922	20.00	0.12964	1.00000	B	3060.000	0.1298
4;G7D	4.9	23.30	28.20	0.50	451.9704	20.00	0.14748	1.00000	B	3060.000	0.1477
4;W7D	4.9	22.89	27.79	0.50	411.2539	20.00	0.13419	1.00000	B	3060.000	0.1344
5;G7D	2.6	23.23	25.83	0.50	261.8846	20.00	0.08545	1.00000	B	3060.000	0.0856
5;W7D	2.6	22.66	25.26	0.50	229.6730	20.00	0.07494	1.00000	B	3060.000	0.0751
12;G7D	2.6	23.44	26.04	0.50	274.8590	20.00	0.08969	1.00000	B	3060.000	0.0898
12;W7D	2.6	23.05	25.65	0.50	251.2523	20.00	0.08198	1.00000	B	3060.000	0.0821
66;G7D	4.9	23.07	27.97	0.50	428.6571	20.00	0.13987	1.00000	B	3060.000	0.1401
66;W7D	4.9	22.78	27.68	0.50	400.9683	20.00	0.13084	1.00000	B	3060.000	0.1310

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 + LTE

Mode	DG (dBi)	Power (dBm)	EIRP (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	-0.50	23.80	23.30	0.50	146.2548	20.00	0.04772	1.00000	B	3060.000	0.0478
4;G7D	4.90	23.30	28.20	0.50	451.9704	20.00	0.14748	1.00000	B	3060.000	0.1477
										Sum Ratio	0.1955
										Ratio Limit	1

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)

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—————