



Test report No. : 4790460525-US-R1-V0
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Issued date : 2022/9/21
FCC ID : RYK-WPEQ276AX

Maximum Permissible Exposure Report

Product : 802.11 ax Mini PCIe Module
Model Name : WPEQ-276AX
FCC ID : RYK-WPEQ276AX
Test Regulation : 47 CFR FCC Part 2.1091
Received Date : 2022/7/18
Test Date : 2022/7/19 ~ 2022/8/31
Issued Date : 2022/9/21
Applicant : SparkLAN Communications, Inc.
5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067,
Taiwan
Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

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REVISION HISTORY

Original Test Report No.: 4790460525-US-R1-V0

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1. Attestation of Test Results

APPLICANT: SparkLAN Communications, Inc.
5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan

MANUFACTURER: SparkLAN Communications, Inc.
5F, No. 199, Ruihu St., Neihu Dist., Taipei City 114067, Taiwan

EUT DESCRIPTION: 802.11 ax Mini PCIe Module

BRAND: SparkLAN

MODEL: WPEQ-276AX

SAMPLE STAGE: Engineering Verification Test sample

APPLICABLE STANDARDS	
STANDARD	Test Results
47 CFR FCC PART 2.1091	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

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Project Handler

Date : 2022/9/21

Approved and Authorized By:

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2. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with KDB 447498 D01 General RF Exposure Guidance v06 and KDB 447498 D04 Interim General RF Exposure Guidance v01.

3. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

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4. Equipment Under Test

4.1. Description of EUT

Product Name	802.11 ax Mini PCIe Module	
Brand Name	SparkLAN	
Model Name	WPEQ-276AX	
Operating Frequency	5.935 ~ 6.415GHz, 6.435 ~ 6.525GHz, 6.525 ~ 6.875GHz, 6.875 ~ 7.115GHz	
Modulation	1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK	
Number of Channel	5925 ~ 6425MHz	25 for 802.11ax (HE20)
		12 for 802.11ax (HE40)
		6 for 802.11ax (HE80)
		3 for 802.11ax (HE160)
	6425 ~ 6525MHz	5 for 802.11ax (HE20)
		3 for 802.11ax (HE40)
		2 for 802.11ax (HE80)
		1 for 802.11ax (HE160)
	6525 ~ 6855MHz	17 for 802.11ax (HE20)
		8 for 802.11ax (HE40)
		3 for 802.11ax (HE80)
		1 for 802.11ax (HE160)
	6875 ~ 7125MHz	13 for 802.11ax (HE20)
		6 for 802.11ax (HE40)
		3 for 802.11ax (HE80)
		2 for 802.11ax (HE160)
Normal Voltage	3.3Vdc	
Sample ID	5245046	

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Note:

1. The EUT have two SKU as below :

Model	SKU	Difference
WPEQ-276AX	SKU #1	With Heatsink Operation Temperatures : -20°C~70°C;
	SKU #2	Without Heatsink Operation Temperatures : -20°C~50°C;

*Except above explanation, there is no different in technical construction that included circuit diagram, PCB Layout, components and component layout, all electrical construction, and mechanical construction.

2. The EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11ax (HE20)	2TX,2RX
802.11ax (HE40)	2TX,2RX
802.11ax (HE80)	2TX,2RX
802.11ax (HE160)	2TX,2RX

3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Antenna 1	SparkLAN	AD-506AX	-
Antenna 2	SparkLAN	AD-501AX	-
Antenna 3	SparkLAN	AD-509AX	-
Antenna 4	SparkLAN	AD-507AX	-
Antenna 5	SparkLAN	AD-508AX	-

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

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4.2. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Frequency Band (MHz)	Maximum Gain (dBi)	Remark
1	Chain (0)+(1)	SparkLAN	AD-506AX	Dipole	2400~2483	2.65	RP-SMA
					5150~5250	4.35	
					5250~5350	4.35	
					5470~5725	4.35	
					5725~5850	4.81	
					5925~6425	4.98	
					6425~6525	4.85	
					6525~6875	4.79	
2	Chain (0)+(1)	SparkLAN	AD-501AX	Dipole	6875~7125	4.82	RP-SMA
					2400~2483	3.7	
					5150~5850	5	
3	Chain (0)+(1)	SparkLAN	AD-509AX	Dipole	5925~7125	5	RP-SMA
					2400~2483	3.7	
					5150~5850	5	
4	Chain (0)+(1)	SparkLAN	AD-507AX	Dipole	5925~7125	5	I-PEX
					2400~2483	2.67	
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
5	Chain (0)+(1)	SparkLAN	AD-508AX	Dipole	6525~6875	4.94	I-PEX
					6875~7125	4.94	
					2400~2483	2.67	
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

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5. Requirement

Limits for General Population/Uncontrolled Exposure

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 1: f = frequency in MHz, * means Plane-wave equivalent power density				
Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.				

Power Density (S) is calculated by the following formula:

$$S=(P \cdot G) / 4 \pi R^2$$

where: S = power density (in appropriate units, e.g. mW/ cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

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6. Radio Frequency Radiation Exposure Evaluation

Non-Beamforming mode

Evaluation Frequency	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5935 ~ 6415	17.71	59.020	0.01174	1
6435 ~ 6515	17.47	55.847	0.01111	1
6535 ~ 6855	17.11	51.404	0.01023	1
6875 ~ 7115	17.65	58.210	0.01158	1

Beamforming mode

Evaluation Frequency	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5935 ~ 6415	20.34	108.143	0.02151	1
6435 ~ 6515	20.14	103.276	0.02055	1
6535 ~ 6855	19.86	96.828	0.01926	1
6875 ~ 7115	20.31	107.399	0.02137	1

Note:

1. Max. EIRP (dBm) = Max. Average power (dBm) + Antenna Gain (dBi)
2. Max. EIRP (mW) = $10^{(\text{Max. EIRP (dBm)} / 10)}$
3. Power density (mW/cm²) = Max. EIRP (mW) / $[4 \times \pi \times (\text{calculated distance})^2]$, the calculated distance is 20 cm.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

END OF REPORT

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