



Test report No. : 4790371368-US-R6-V0  
Page : 1 of 14  
Issued date : 2022/11/8  
FCC ID : RYK-WPEQ268AXB

# Maximum Permissible Exposure Report

**Product** : Wi-Fi 6E BT Half Min PCIe Module

**Model Name** : WPEQ-268AXI(BT)

**Series Model** : WPEQ-268AX(BT)

**FCC ID** : RYK-WPEQ268AXB

**Test Regulation** : 47 CFR FCC Part 2.1091

**Received Date** : 2022/4/18

**Test Date** : 2022/4/29 ~ 2022/6/13

**Issued Date** : 2022/11/8

**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.

## **Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone : +886-2-7737-3000  
Facsimile (FAX) : +886-3-583-7948





## Table of Contents

<b>1. Attestation of Test Results.....</b>	<b>4</b>
<b>2. Test Methodology and Reference Procedures .....</b>	<b>5</b>
<b>3. Facilities and Accreditation .....</b>	<b>5</b>
<b>4. Equipment Under Test .....</b>	<b>6</b>
4.1. Description of EUT.....	6
4.2. Description of Available Antennas.....	10
<b>5. Requirement .....</b>	<b>10</b>
<b>6. Radio Frequency Radiation Exposure Evaluation .....</b>	<b>12</b>

### **Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone :+886-2-7737-3000  
Facsimile (FAX) :+886-3-583-7948



## 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:** Wi-Fi 6E BT Half Min PCIe Module

**BRAND:** SparkLAN

**MODEL:** WPEQ-268AXI(BT)

**SERIES MODEL:** WPEQ-268AX(BT)

**SAMPLE STAGE:** Engineering Verification Test sample

<b>APPLICABLE STANDARDS</b>	
<b>STANDARD</b>	<b>Test Results</b>
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:

Cindy Hsin  
 Project Handler

Date : 2022/11/8

Approved and Authorized By:

Kent Liu  
 Senior Laboratory Engineer

Date : 2022/11/8

### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
 Telephone :+886-2-7737-3000  
 Facsimile (FAX) :+886-3-583-7948



## 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

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

### **Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone :+886-2-7737-3000  
Facsimile (FAX) :+886-3-583-7948



## 4. Equipment Under Test

### 4.1. Description of EUT

<b>Product Name</b>	Wi-Fi 6E BT Half Min PCIe Module	
<b>Brand Name</b>	SparkLAN	
<b>Model Name</b>	WPEQ-268AXI(BT)	
<b>Series Model</b>	WPEQ-268AX(BT)	
<b>Operating Frequency</b>	Bluetooth EDR	2402MHz ~ 2480MHz
	Bluetooth LE	2402MHz ~ 2480MHz
	WLAN	<b>2.4GHz:</b> 2412MHz ~ 2462MHz <b>5GHz:</b> 5180MHz ~ 5240MHz 5260MHz ~ 5320MHz 5500MHz ~ 5720MHz 5745MHz ~ 5825MHz <b>6GHz:</b> 5955MHz ~ 6415MHz 6435MHz ~ 6525MHz 6525MHz ~ 6875MHz 6875MHz ~ 7115MHz
<b>Modulation</b>	Bluetooth EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
	Bluetooth LE	GFSK
	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA
<b>Number of Channel</b>	Bluetooth EDR	79
	Bluetooth LE	40

### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone : +886-2-7737-3000  
Facsimile (FAX) : +886-3-583-7948



<b>Number of Channel</b>	2.4G WLAN 2412 ~ 2462 MHz	11 for 802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20) 7 for 802.11n (HT40), 802.11ax (HE40)
	5G WLAN 5180 ~ 5240 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
	5G WLAN 5260 ~ 5320 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)
		1 for 802.11ac (VHT160), 802.11ax (HE160)
	5G WLAN 5500 ~ 5720 MHz	12 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		6 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		3 for 802.11ac (VHT80), 802.11ax (HE80),
		1 for 802.11ac (VHT160), 802.11ax (HE160)
	5G WLAN 5745 ~ 5825 MHz	5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20)
		2 for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40)
		1 for 802.11ac (VHT80), 802.11ax (HE80)

**Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone :+886-2-7737-3000  
Facsimile (FAX) :+886-3-583-7948



<b>Number of Channel</b>	6G WLAN 5925 ~ 6425MHz	24 for 802.11a, 802.11ax (HE20)
		12 for 802.11ax (HE40)
		6 for 802.11ax (HE80)
		3 for 802.11ax (HE160)
	6G WLAN 6425 ~ 6525MHz	5 for 802.11a,802.11ax (HE20)
		3 for 802.11ax (HE40)
		2 for 802.11ax (HE80)
		1 for 802.11ax (HE160)
	6G WLAN 6525 ~ 6855MHz	17 for 802.11a,802.11ax (HE20)
		8 for 802.11ax (HE40)
		3 for 802.11ax (HE80)
		1 for 802.11ax (HE160)
	6G WLAN 6875 ~ 7125MHz	13 for 802.11a,802.11ax (HE20)
6 for 802.11ax (HE40)		
3 for 802.11ax (HE80)		
2 for 802.11ax (HE160)		
<b>Normal Voltage</b>	3.3 Vdc	
<b>Sample ID</b>	4862912	

**Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone :+886-2-7737-3000  
Facsimile (FAX) :+886-3-583-7948





Note:

1. The models difference table as below:

Model	Difference
WPEQ-268AXI(BT)	Operating Temp -40~+75°C
WPEQ-268AX(BT)	Operating Temp -10~+65°C

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

Modulation Mode	Tx,Rx Function
802.11a	2TX,2RX
802.11b	2TX,2RX
802.11g	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX
802.11ac (VHT20)	2TX,2RX
802.11ac (VHT40)	2TX,2RX
802.11ac (VHT80)	2TX,2RX
802.11ac (VHT160)	2TX,2RX
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-312N	-
Antenna 4	SparkLAN	AD-509AX	-
Antenna 5	SparkLAN	AD-103AG	-
Antenna 6	SparkLAN	AD-302N	-
Antenna 7	SparkLAN	AD-303N	-
Antenna 8	SparkLAN	AD-315N	-
Antenna 9	SparkLAN	AD-507AX	-
Antenna 10	SparkLAN	AD-508AX	-
I-PEX Cable	SparkLAN	N/A	RP-SMA to I-PEX

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

### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone :+886-2-7737-3000  
Facsimile (FAX) :+886-3-583-7948



#### 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	I-PEX
					5150~5250	4.35	
					5250~5350	4.35	
					5470~5725	4.35	
					5725~5850	4.81	
					5925~6425	4.98	
					6425~6525	4.85	
					6875~7125	4.79	
2	Chain (0)+(1)	SparkLAN	AD-501AX	Dipole	2400~2483	3.7	RP-SMA
					5150~5850	5	
					5925~7125	5	
3	Chain (0)+(1)	SparkLAN	AD-312N	Dipole	2400~2483	2.65	I-PEX
					5150~5875	4.86	
4	Chain (0)+(1)	SparkLAN	AD-509AX	Dipole	2400~2483	3.7	I-PEX
					5150~5850	5	
					5925~7125	5	
5	Chain (0)+(1)	SparkLAN	AD-103AG	Dipole	2400~2483	2.02	RP-SMA
					5150~5875	2.03	
6	Chain (0)+(1)	SparkLAN	AD-302N	Dipole	2400~2483	3.14	RP-SMA
					5150~5875	2.87	
7	Chain (0)+(1)	SparkLAN	AD-303N	Dipole	2400~2483	3.14	RP-SMA
					5150~5875	3.45	
8	Chain (0)+(1)	SparkLAN	AD-315N	Dipole	2400~2483	3	I-PEX
					5150~5875	5	
9	Chain (0)+(1)	SparkLAN	AD-507AX	Dipole	2400~2483	2.67	I-PEX
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
					6875~7125	4.94	
10	Chain (0)+(1)	SparkLAN	AD-508AX	Dipole	2400~2483	2.67	I-PEX
					5150~5250	4.35	
					5250~5350	3.83	
					5470~5725	4.7	
					5725~5850	4.87	
					5925~6425	4.91	
					6425~6525	4.85	
					6875~7125	4.94	

- Note: 1. The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.  
2. For above antenna connector type: RP-SMA need to be combined with I-PEX cable.

#### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone :+886-2-7737-3000  
Facsimile (FAX) :+886-3-583-7948



## 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	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/ cm<sup>2</sup>)

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)

### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948



## 6. Radio Frequency Radiation Exposure Evaluation

### Non-Beamforming mode

#### Bluetooth EDR

Evaluation Frequency (MHz)	Max. Average power (dBm)	Antenna Gain (dBi)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2402 ~ 2480	8.55	3.70	12.25	16.788	0.00334	1

#### Bluetooth LE

Evaluation Frequency (MHz)	Max. Average power (dBm)	Antenna Gain (dBi)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2402 ~ 2480	4.92	3.70	8.62	7.278	0.00145	1

#### WLAN 2.4GHz

Evaluation Frequency (MHz)	Max. Average power (dBm)	Directional Gain (dBi)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412 ~ 2462	22.58	6.71	29.29	849.180	0.16894	1

#### WLAN 5GHz

Evaluation Frequency (MHz)	Max. Average power (dBm)	Directional Gain (dBi)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5180 ~ 5240	20.15	8.01	28.16	654.636	0.13024	1
5260 ~ 5320	20.22	8.01	28.23	665.273	0.13235	1
5500 ~ 5720	22.59	8.01	30.60	1148.154	0.22842	1
5745 ~ 5825	22.60	8.01	30.61	1150.800	0.22894	1

#### WLAN 6GHz

Evaluation Frequency (MHz)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5935 ~ 6415	16.63	46.026	0.00916	1
6435 ~ 6515	15.93	39.174	0.00779	1
6535 ~ 6855	15.60	36.308	0.00722	1
6875 ~ 7115	15.92	39.084	0.00778	1

### Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone : +886-2-7737-3000  
Facsimile (FAX) : +886-3-583-7948



## Beamforming mode

### WLAN 2.4GHz

Evaluation Frequency (MHz)	Max. Average power (dBm)	Directional Gain (dBi)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412 ~ 2462	19.77	6.71	26.48	444.631	0.08846	1

### WLAN 5GHz

Evaluation Frequency (MHz)	Max. Average power (dBm)	Directional Gain (dBi)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5180 ~ 5240	19.95	8.01	27.96	625.173	0.12437	1
5260 ~ 5320	19.98	8.01	27.99	629.506	0.12524	1
5500 ~ 5720	22.38	8.01	30.39	1093.956	0.21764	1
5745 ~ 5825	21.93	8.01	29.94	986.279	0.19621	1

### WLAN 6GHz

Evaluation Frequency (MHz)	Max. EIRP (dBm)	Max. EIRP (mW)	Power density @ 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5935 ~ 6415	19.57	90.573	0.01802	1
6435 ~ 6515	18.88	77.268	0.01537	1
6535 ~ 6855	18.48	70.469	0.01402	1
6875 ~ 7115	18.86	76.913	0.01530	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/cm<sup>2</sup>) = Max. EIRP (mW) / [  $4 \times \pi \times (\text{calculated distance})^2$  ], the calculated distance is 20 cm.

## Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan  
Telephone : +886-2-7737-3000  
Facsimile (FAX) : +886-3-583-7948



**Conclusion:**

The Bluetooth and WLAN 5GHz, Bluetooth and WLAN 6GHz, WLAN 2.4GHz and WLAN 5GHz, WLAN 2.4GHz and WLAN 6GHz can transmit simultaneously, the formula of calculated the MPE is:  
 $CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Bluetooth + WLAN 5GHz

Situation is  $(0.00334 / 1) + (0.22894 / 1) = 0.23228$

Bluetooth + WLAN 6GHz

Situation is  $(0.00334 / 1) + (0.00916 / 1) = 0.0125$

WLAN 2.4GHz + WLAN 5GHz

Situation is  $(0.16894 / 1) + (0.22894 / 1) = 0.39788$

WLAN 2.4GHz + WLAN 6GHz

Situation is  $(0.16894 / 1) + (0.00916 / 1) = 0.1787$

Therefore the maximum calculations of above situations are less than the “1” limit.

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

---

**END OF REPORT**

**Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0864 / 5.0