



Test report No. : 4789431832-US-R5-V0
Page : 1 of 11
Issued date : Jul. 13, 2020
FCC ID : 2AVP7-K3V1

Maximum Permissible Exposure Report

Product : 802.11ac/b/g/n WiFi + Bluetooth M.2 Card

Model Name : WNFQ-258ACN(BT)

FCC ID : 2AVP7-K3V1

Test Regulation : 47 CFR FCC Part 2.1091

Received Date : Mar. 25, 2020

Issued Date : Jul. 13, 2020

Applicant : Bizerba SE & Co. KG
Wilhelm-Kraut-Straße 65, 72336 Balingen, Germany

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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Test report No. : 4789431832-US-R5-V0
Page : 2 of 11
Issued date : Jul. 13, 2020
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REVISION HISTORY

Original Test Report No.: 4789431832-US-R5-V0

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Table Of Contents

1. Attestation of Test Results.....	4
2. Test Methodology and Reference Procedures	5
3. Facilities and Accreditation	5
4. Equipment Under Test	6
4.1. Description of EUT.....	6
4.2. Description Of Available Antennas	9
5. Requirement	10
6. Radio Frequency Radiation Exposure Evaluation	11

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Test report No. : 4789431832-US-R5-V0
Page : 4 of 11
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1. Attestation of Test Results

APPLICANT: Bizerba SE & Co. KG
Wilhelm-Kraut-Straße 65, 72336 Balingen, Germany

MANUFACTURER SparkLAN Communications, Inc.
8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City
11493, Taiwan (R.O.C.)

EUT DESCRIPTION: 802.11ac/b/g/n WiFi + Bluetooth M.2 Card

MODEL: WNFQ-258ACN(BT)

SAMPLE STAGE: Identical Prototype

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 : Jul. 13, 2020

Approved and Authorized By:

Sky Zhou
Engineer

Date : Jul. 13, 2020

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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.

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. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

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4. Equipment Under Test

4.1. Description of EUT

Product Name	802.11ac/b/g/n WiFi + Bluetooth M.2 Card	
Model Name	WNFQ-258ACN(BT)	
Operating Frequency	Bluetooth EDR	2402MHz ~ 2480MHz
	Bluetooth LE	2402MHz ~ 2480MHz
	WLAN	2.4GHz: 2412MHz ~ 2472MHz 5GHz: 5180 ~ 5240 MHz, 5260 ~ 5320 MHz 5500 ~ 5720 MHz, 5745 ~ 5825 MHz
Modulation	Bluetooth EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
	Bluetooth LE	GFSK
	WLAN	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM

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Test report No. : 4789431832-US-R5-V0
Page : 7 of 11
Issued date : Jul. 13, 2020
FCC ID : 2AVP7-K3V1

Number of Channel	2.4G WLAN 2412 ~ 2472 MHz	13 for 802.11b, 802.11g, 802.11n (HT20) 9 for 802.11n (HT40)
	5G WLAN 5180 ~ 5240 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
	5G WLAN 5260 ~ 5320 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
	5G WLAN 5500 ~ 5720 MHz	12 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		6 for 802.11n (HT40), 802.11 ac (VHT40)
		3 for 802.11ac (VHT80)
	5G WLAN 5745 ~ 5825 MHz	5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
	Bluetooth EDR	79
	Bluetooth LE	40
Normal Voltage	3.3 Vdc	
S/N	1926012007465	
Hardware Version	WNFQ-258ACN(BT)	
Software Version	12.0.0.448	

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Note:

1. The EUT incorporates a MIMO function. Physically, 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

2. The EUT contains following accessory devices

Product	Brand	Model	Description
N/A	N/A	N/A	N/A

3. 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

Product	Brand	Model	Antenna Type	Remark
Antenna 0	ethertronics	1000423	PIFA	2.4GHz: 0.6dBi 5GHz: 4.5dBi
Antenna 1	ethertronics	1000423	PIFA	2.4GHz: 0.6dBi 5GHz: 4.5dBi
IPEX cable	N/A	N/A	N/A	Length: 130mm cable
IPEX cable	N/A	N/A	N/A	Length: 60mm cable

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:

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

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

Bluetooth EDR

Evaluation Frequency	Max. Average power	Antenna Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
2402 ~ 2480	5.31	0.60	5.91	3.899	0.001	1

Bluetooth LE

Evaluation Frequency	Max. Average power	Antenna Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
2402 ~ 2480	1.53	0.60	2.13	1.633	0.0003	1

WLAN 2.4GHz

Evaluation Frequency	Max. Average power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
2412 ~ 2472	22.85	3.61	26.46	442.588	0.088	1

WLAN 5GHz

Evaluation Frequency	Max. Average power	Directional Gain	Max. EIRP	Max. EIRP	Power density @ 20 cm	Limit
(MHz)	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)
5180 ~ 5240	16.84	7.51	24.35	272.270	0.054	1
5260 ~ 5320	18.55	7.51	26.06	403.645	0.080	1
5500 ~ 5720	18.80	7.51	26.31	427.563	0.085	1
5745 ~ 5825	18.58	7.51	26.09	406.443	0.081	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:

Both of the Bluetooth EDR and WLAN 5GHz can transmit simultaneously, the formula of calculated the MPE is:

$$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Bluetooth EDR + WLAN 5GHz = 0.001 + 0.085 = 0.086, 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.

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