RF Exposure Report

Report No.:	SABENL-WTW-P21051124
FCC ID:	RYK-WNFQ261ACNIBT
Test Model:	WNFQ-261ACNI(BT)
Received Date:	May 28, 2021
Test Date:	July 19, 2021
Issued Date:	Sep. 06, 2021
Applicant:	SparkLAN Communications, Inc.
Address:	8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan (R.O.C.)
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location :	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

Testing Laboratory
2022

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
SABENL-WTW-P21051124	Original release.	Sep. 06, 2021

1 Certificate of Conformity

Product:	802.11ac/a/b/g/n 2T2R Industrial-graded Wi-Fi / Bluetooth 4.2 Combo M.2 2230 Module
Brand:	Sparklan
Test Model:	WNFQ-261ACNI(BT)
Sample Status:	R&D SAMPLE
Applicant:	SparkLAN Communications, Inc.
Test Date:	July 19, 2021
Standards:	FCC Part 2 (Section 2.1091) KDB 447498 D01 General RF Exposure Guidance v06 IEEE C95.1-1992

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Sep. 06, 2021

Claire Kuan / Specialist

Approved by : _____ , **Date:** Sep. 06, 2021

Clark Lin / Technical Manager

2 RF Exposure

2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
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

f = Frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Ant. Set.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
1	Chain (0)	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56 Band 3: 4.76 Band 4: 4.76	1.15	Band 1&2: 1.70 Band 3: 1.74 Band 4: 1.79	IPEX	300
	Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08 Band 3: 3.31 Band 4: 2.42	1.15	Band 1&2: 1.70 Band 3: 1.74 Band 4: 1.79	IPEX	300

Ant. Set.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
2	Chain (0)	INPAQ	DAM-I6-H-DB-800-10-17	Dipole	1.13	Band 1&2: 1.33 Band 3: -0.63 Band 4: -0.97	NA	NA	SMA RP Plug	900
	Chain (1)	INPAQ	DAM-I6-H-DB-800-10-17	Dipole	1.29	Band 1&2: 1.94 Band 3: -0.49 Band 4: -0.93	NA	NA	SMA RP Plug	900

Ant. Set.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	Connector Type	Cable Length (mm)
3	Chain (0) Chain (1)	Sparklan	AD-301N	Dipole	4.4	Band 1&2: 5.2 Band 3&4: 5.8	IPEX MHF 4 at modular side & RP-SMA (M) at antenna side	150
4	Chain (0) Chain (1)	Sparklan	AD-103AG	Dipole	2.02	Band 1&2: 1.93 Band 3&4: 2.03		150
5	Chain (0) Chain (1)	Sparklan	AD-305N	Dipole	5.0	5.0		150
6	Chain (0) Chain (1)	Sparklan	AD-303N	Dipole	3.0	3.0		150
7	Chain (0) Chain (1)	Sparklan	AD-302N	Dipole	3.0	2.0		150

Ant. Set.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	Connector Type	Cable Length (mm)
8	Chain (0) Chain (1)	SANAV	GEPH-023 401GEPH16-022G0 00000032-001	PCB	4.78	4.73	IPEX4L MHF	320

3 Calculation Result of Maximum Conducted Power

For WLAN:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2412-2462	479.026	8.01	20	0.1755	1
5180-5240	111.461	8.21	20	0.14684	1
5260-5320	111.355	8.21	20	0.1467	1
5500-5720	106.279	8.81	20	0.16076	1
5745-5825	108.058	8.81	20	0.16345	1

NOTE:
2.4GHz: Directional gain = 5dBi + 10log(2) = 8.01dBi
5GHz:
UNII-1, UNII-2A: Directional gain = 5.20dBi + 10log(2) = 8.21dBi
UNII-2C, UNII-3: Directional gain = 5.80dBi + 10log(2) = 8.81dBi

For Bluetooth:
BT-EDR:

Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	6.281	5	20	0.00233	1

BT-LE:

Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	1.365	5	20	0.00081	1

Conclusion:

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

$CPD_1 / LPD_1 + CPD_2 / LPD_2$ + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is 0.16345 / 1 + 0.00233 / 1 = 0.16578, which is less than “1”.

--- END ---