RF Exposure Evaluation Report

APPLICANT	:	**Vantiva USA LLC**
EQUIPMENT	:	**Wireless router**
BRAND NAME	:	**Vantiva**
MODEL NAME	:	**OWA0111TCH1, OWA0111TCH2, OWA0111XXXXX (where X can be alphanumeric, -, or blank)**
FCC ID	:	**G95OWA0111**
STANDARD	:	**47 CFR Part 2.1091**

The product evaluation date was started from Jan. 09, 2023 and completed on Jan. 09, 2023. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA2N0411-02	Rev. 01	Initial issue of report.	Jul. 24, 2023

1. Administration Data

1.1. Testing Laboratory

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	SAR01-KS	CN1257	314309

Applicant	
Company Name	Vantiva USA LLC
Address	44855 Peachtree Industrial Blvd. Suite 200 Norcross, Georgia 30092

Manufacturer	
Company Name	Cal-Comp Electronics (Thailand) Public Co.,Ltd
Address	138 MOO 4 Petchkasem Road, Sapang, Khaoyoi, Petchburi 76140, THAILAND

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Wireless router
Brand Name	Vantiva
Model Name	OWA0111TCH1, OWA0111TCH2, OWA0111XXXXX (where X can be alphanumeric, -, or blank)
FCC ID	G95OWA0111
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ac VHT20/VHT40 WLAN 2.4GHz 802.11ax HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/VHT160 WLAN 5GHz 802.11ax HE20/HE40/HE80/HE160
Antenna Type	WLAN: Offboard pcb antenna with coaxial RF cable
HW Version	FGR
SW Version	17.10.188.6401 (r808804)
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This device support beamforming for WLAN 2.4GHz 802.11n/ac/ax HT20/HT40//VHT20/VHT40/HE20/HE40, WLAN 5GHz 802.11n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160.
3. WLAN2.4GHz/WLAN5GHz all support SISO and MIMO mode, we chose MIMO tune up power to perform MPE calculation conservatively.
4. This is a variant report. The difference between current project and previous project is enabled TDWR Band (5600 MHz ~5650 MHz) by software. According to the difference, all the results are referred to the original report FA2N0411.

Comments and Explanations:
1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.

Antenna Gain:

WLAN	Ant.1	Ant.2	Beamforming
WLAN2.4GHz	3.18	3.15	5.42
WLAN5.2GHz	5.25	3.85	6.39
WLAN5.3GHz	5.30	3.69	6.39
WLAN5.5GHz	5.79	4.21	6.41
WLAN5.8GHz	5.81	4.21	6.47

3. Maximum RF average output tune up power among production units

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)		
		Ant.1	Ant.2	Ant.1+2
2.4GHz	802.11b	23.00	23.00	26.00
	802.11g	24.00	24.00	27.00
	802.11n-HT20	24.00	24.00	27.00
	802.11n-HT40	20.00	20.00	23.00
	802.11ac-VHT20	24.00	24.00	27.00
	802.11ac-VHT40	20.00	20.00	23.00
	802.11ax-HE20	24.00	24.00	27.00
	802.11ax-HE40	20.00	20.00	23.00

<5GHz WLAN >

Mode		Maximum Average Power (dBm)		
		Ant.1	Ant.2	Ant.1+2
5.2GHz	802.11a	27.00	27.00	30.00
	802.11n-HT20	27.00	27.00	30.00
	802.11n-HT40	26.00	26.00	29.00
	802.11ac-VHT20	27.00	27.00	30.00
	802.11ac-VHT40	26.00	26.00	29.00
	802.11ac-VHT80	20.00	20.00	23.00
	802.11ax-HE20	27.00	27.00	30.00
	802.11ax-HE40	26.00	26.00	29.00
	802.11ax-HE80	20.00	20.00	23.00
5.3GHz	802.11a	21.00	21.00	23.98
	802.11n-HT20	21.00	21.00	23.98
	802.11n-HT40	21.00	21.00	23.98
	802.11ac-VHT20	21.00	21.00	23.98
	802.11ac-VHT40	21.00	21.00	23.98
	802.11ac-VHT80	21.00	21.50	23.98
	802.11ac-VHT160	18.00	18.00	21.00
	802.11ax-HE20	21.00	21.00	23.98
	802.11ax-HE40	21.00	21.00	23.98
	802.11ax-HE80	21.00	21.50	23.98
	802.11ax-HE160	18.00	18.00	21.00
5.5GHz	802.11a	21.00	21.00	23.98
	802.11n-HT20	21.00	21.00	23.98
	802.11n-HT40	21.00	21.00	23.98
	802.11ac-VHT20	21.00	21.00	23.98
	802.11ac-VHT40	21.00	21.00	23.98
	802.11ac-VHT80	21.00	21.50	23.98
	802.11ac-VHT160	18.00	21.00	23.00
	802.11ax-HE20	21.00	21.00	23.98
	802.11ax-HE40	21.00	21.00	23.98

	802.11ax-HE80	21.00	21.50	23.98
	802.11ax-HE160	18.00	21.00	23.00
5.8GHz	802.11a	28.00	28.00	30.00
	802.11n-HT20	28.00	28.00	30.00
	802.11n-HT40	28.00	28.00	30.00
	802.11ac-VHT20	28.00	28.00	30.00
	802.11ac-VHT40	28.00	28.00	30.00
	802.11ac-VHT80	28.00	28.00	30.00
	802.11ax-HE20	28.00	28.00	30.00
	802.11ax-HE40	28.00	28.00	30.00
	802.11ax-HE80	28.00	28.00	30.00

Note: WLAN2.4GHz/WLAN5GHz all support SISO/MIMO mode, we only chose MIMO tune up power to perform MPE calculation conservatively for MIMO power is higher.

<For Beamforming mode>

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.1+2
2.4GHz	802.11n-HT20	26.00
	802.11n-HT40	22.00
	802.11ac-VHT20	26.00
	802.11ac-VHT40	22.00
	802.11ax-HE20	26.00
	802.11ax-HE40	22.00

<5GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.1+2
5.2GHz	802.11n-HT20	29.61
	802.11n-HT40	29.61
	802.11ac-VHT20	29.61
	802.11ac-VHT40	29.61
	802.11ac-VHT80	29.61
	802.11ax-HE20	29.61
	802.11ax-HE40	29.61
	802.11ax-HE80	29.61
5.3GHz	802.11n-HT20	23.59
	802.11n-HT40	23.59
	802.11ac-VHT20	23.59
	802.11ac-VHT40	23.59
	802.11ac-VHT80	23.59
	802.11ac-VHT160	23.59
	802.11ax-HE20	23.59
	802.11ax-HE40	23.59
	802.11ax-HE80	23.59
	802.11ax-HE160	23.59
5.5GHz	802.11n-HT20	23.57
	802.11n-HT40	23.57

	802.11ac-VHT20	23.57
	802.11ac-VHT40	23.57
	802.11ac-VHT80	23.57
	802.11ac-VHT160	20.00
	802.11ax-HE20	23.57
	802.11ax-HE40	23.57
	802.11ax-HE80	23.57
	802.11ax-HE160	20.00
5.8GHz	802.11n-HT20	29.53
	802.11n-HT40	29.53
	802.11ac-VHT20	29.53
	802.11ac-VHT40	29.53
	802.11ac-VHT80	29.53
	802.11ax-HE20	29.53
	802.11ax-HE40	29.53
	802.11ax-HE80	29.53

Note: This device support beamforming for WLAN 2.4GHz 802.11n/ac/ax HT20/HT40//VHT20/VHT40/HE20/HE40, WLAN 5GHz 802.11n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160.

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	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				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 21 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 21cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
2.4GHz WLAN	2412.0	3.18	27.00	30.180	1042.317	0.188	1.000	**0.188**
5.2GHz WLAN	5180.0	5.25	30.00	35.250	3349.654	0.605	1.000	0.605
5.3GHz WLAN	5260.0	5.30	23.98	29.280	847.227	0.153	1.000	0.153
5.5GHz WLAN	5500.0	5.79	23.98	29.770	948.418	0.171	1.000	0.171
5.8GHz WLAN	5745.0	5.81	30.00	35.810	3810.658	0.688	1.000	**0.688**

<For Beamforming mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 21cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
2.4GHz WLAN	2412.0	5.42	26.00	31.420	1386.756	0.250	1.000	**0.250**
5.2GHz WLAN	5180.0	6.39	29.61	36.000	3981.072	0.719	1.000	**0.719**
5.3GHz WLAN	5260.0	6.39	23.59	29.980	995.405	0.180	1.000	0.180
5.5GHz WLAN	5500.0	6.41	23.57	29.980	995.405	0.180	1.000	0.180
5.8GHz WLAN	5745.0	6.47	29.53	36.000	3981.072	0.719	1.000	0.719

Note:
1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. WLAN2.4GHz and WLAN5GHz chose the higher SISO gain as MIMO gain to perform MPE calculation.
3. Chose the maximum power to do MPE analysis.
4. According to the EUT characteristic, WLAN 5GHz and WLAN 2.4GHz can transmit simultaneously.

5.2. Collocated Power Density Calculation

WLAN2.4GHz Power Density / Limit	WLAN5GHz Power Density / Limit	Σ(Power Density / Limit) of WLAN2.4GHz + WLAN5GHz
0.188	0.688	0.876

<For Beamforming mode>

WLAN2.4GHz Power Density / Limit	WLAN5GHz Power Density / Limit	Σ(Power Density / Limit) of WLAN2.4GHz + WLAN5GHz
0.250	0.719	0.969

Note:

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN2.4GHz + WLAN5GHz.
2. Considering the WLAN2.4GHz module collocation with the WLAN5GHz transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant.

Conclusion:

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

------THE END------