RF Exposure Evaluation Report

APPLICANT	:	Ignition Design Labs (US) LLC
EQUIPMENT	:	Advanced Wireless Router
BRAND NAME	:	Ignition Design Labs
MODEL NAME	:	Portal
MARKETING NAME	:	Portal
FCC ID	:	2AFZUSAP102
STANDARD	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA652049	Rev. 01	Initial issue of report	Jul. 14, 2016

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Ignition Design Labs (US) LLC
Address	5F-2., No.158, Sec.2, Gongdao 5th Rd., Hsinchu City 30070, Taiwan

Manufacturer	
Company Name	Ignition Design Labs (US) LLC
Address	5F-2., No.158, Sec.2, Gongdao 5th Rd., Hsinchu City 30070, Taiwan

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Advanced Wireless Router
Brand Name	Ignition Design Labs
Model Name	Portal
Marketing Name	Portal
FCC ID	2AFZUSAP102
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 · Bluetooth EDR/LE
HW Version	v1.0
SW Version	v1.0
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

3. Maximum RF average output power among production units

Mode / Band	Average Power (dBm)			
	Ant 8			
	EDR			LE
	1Mbps	2Mbps	3Mbps	
2.4 GHz Bluetooth	7.5	5	5	3.5

WLAN 2.4GHz					
Mode	Data Rate	NTX	CH.	Freq.(MHz)	Average Power (dBm)
					Ant 8
11b	1Mbps	1	1	2412	14.5
11b	1Mbps	1	6	2437	16
11b	1Mbps	1	11	2462	9
11g	6Mbps	1	1	2412	16
11g	6Mbps	1	6	2437	22.5
11g	6Mbps	1	11	2462	20
HT20	MCS0	1	1	2412	16
HT20	MCS0	1	6	2437	22.5
HT20	MCS0	1	11	2462	19
HT40	MCS0	1	3	2422	11.5
HT40	MCS0	1	6	2437	15
HT40	MCS0	1	9	2452	17

WLAN 2.4GHz								
Mode	Data Rate	N_{TX}	CH.	Freq.(MHz)	Average Power (dBm)			
					Ant 5	Ant 6	Ant 7	SUM
11b	1Mbps	3	1	2412	21.5	20.5	20.5	26
11b	1Mbps	3	6	2437	24.5	24	24	29
11b	1Mbps	3	11	2462	21	21	21	26
11g	6Mbps	3	1	2412	15.5	15	15	20
11g	6Mbps	3	6	2437	15.5	14.5	15.5	20
11g	6Mbps	3	11	2462	17.5	17	17	22
HT20	MCS0	3	1	2412	14.5	13.5	14	19
HT20	MCS0	3	6	2437	16	15.5	16	21
HT20	MCS0	3	11	2462	16.5	16	16	21
HT40	MCS0	3	3	2422	11.5	11	10.5	16
HT40	MCS0	3	6	2437	16.5	16.5	16.5	21.5
HT40	MCS0	3	9	2452	12.5	13	12.5	17.5

WLAN 5.2GHz									
Mode	Data Rate	NTX	CH.	Freq. (MHz)	Average Power (dBm)				
					Ant 1	Ant 2	Ant 3	Ant 4	SUM
11a	6Mbps	4	36	5180	19	19.5	18.5	19	25.5
11a	6Mbps	4	44	5220	19	19.5	19.5	19.5	25.5
11a	6Mbps	4	48	5240	18.5	19	20	20	25.5
HT20	MCS0	4	36	5180	15.5	16	15.5	15.5	22
HT20	MCS0	4	44	5220	15	15.5	16	15.5	22
HT20	MCS0	4	48	5240	14	14.5	15	15	21
HT40	MCS0	4	38	5190	17	17	17	17	23.5
HT40	MCS0	4	46	5230	17.5	18	19	18.5	24.5
VHT20	MCS0	4	36	5180	13.5	13	14	13.5	20
VHT20	MCS0	4	44	5220	14	14	13.5	13	20
VHT20	MCS0	4	48	5240	15	14	13	12.5	20
VHT40	MCS0	4	38	5190	16	16	17	16.5	22.5
VHT40	MCS0	4	46	5230	16.5	16.5	15.5	15	22
VHT80	MCS0	4	42	5210	15.5	14.5	15	14.5	21

WLAN 5.8GHz									
Mode	Data Rate	NTX	CH.	Freq. (MHz)	Average Power (dBm)				
					Ant 1	Ant 2	Ant 3	Ant 4	SUM
11a	6Mbps	4	149	5745	22.5	22.5	22	22.5	28.5
11a	6Mbps	4	157	5785	20.5	20	20	20	26.5
11a	6Mbps	4	165	5825	19.5	19	19	19	25.5
HT20	MCS0	4	149	5745	19	19	19	19	25.5
HT20	MCS0	4	157	5785	19.5	19	19	19	25.5
HT20	MCS0	4	165	5825	20.5	19.5	19.5	19.5	26
HT40	MCS0	4	151	5755	19.5	19.5	19.5	19.5	26
HT40	MCS0	4	159	5795	20	19.5	19.5	19.5	26
VHT20	MCS0	4	149	5745	20	19.5	19.5	18.5	25.5
VHT20	MCS0	4	157	5785	20	19.5	19.5	19	26
VHT20	MCS0	4	165	5825	20.5	20	20	20	26.5
VHT40	MCS0	4	151	5755	20	19.5	19.5	19	26
VHT40	MCS0	4	159	5795	20.5	20	20	19.5	26.5
VHT80	MCS0	4	155	5775	20	19.5	19.5	19	26

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 30 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

Antenna	Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 30cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
Ant 8	Bluetooth	2402	2.73	7.5	10.230	0.011	10.544	0.001	1.000	0.001
	WLAN 2.4GHz	2437	2.73	22.5	25.230	0.333	333.426	0.029	1.000	0.029
Ant 5/6/7	WLAN 2.4GHz	2437	3.74	29	32.740	1.879	1879.317	0.166	1.000	0.166
Ant 1/2/3/4	WLAN 5GHz	5745	4.67	28.5	33.170	2.075	2074.914	0.184	1.000	0.184

Note:
1. For this device, the 2.4GHz and 5GHz radios will transmit and receive simultaneously.
2. WLAN 2.4GHz and Bluetooth share the same antenna 8, and cannot transmit simultaneously.

<For Beamforming mode>

Antenna	Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 30cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
Ant 1/2/3/4	WLAN 5GHz	5825	10.21	26.5	36.710	4.688	4688.134	0.415	1.000	0.415

Note:
1. This device support Beamforming for WLAN 5GHz VHT20/VHT40/VHT80 only; therefore, in the table above which consider maximun directional Gain 10.21 dBi for Beamforming mode.

5.2. Collocated Power Density Calculation

(Ant 8) WLAN 2.4GHz Power Density / Limit	(Ant 5/6/7) WLAN 2.4GHz Power Density / Limit	(Ant 1/2/3/4) WLAN 5GHz Power Density / Limit	Σ(Power Density / Limit)
0.029	0.166	0.415	0.610

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 all radio transmitter.
2. Considering all antenna collocation of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of all collocated transmitters is compliant

Conclusion:

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