RF Exposure Evaluation Report

APPLICANT	:	**Hewlett Packard Enterprise Company**
EQUIPMENT	:	**Wireless Access Point**
BRAND NAME	:	**aruba**
MODEL NAME	:	**APIN0304, APIN0305**
MARKETING NAME	:	**APIN0304, APIN0305**
FCC ID	:	**Q9DAPIN0304305**
STANDARD	:	**47 CFR Part 2.1091**

We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Mark Qu

Prepared by: Mark Qu / Manager

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA670709	Rev. 01	Initial issue of report	Sep. 20, 2016

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958

Applicant	
Company Name	Hewlett Packard Enterprise Company
Address	3000 Hanover Street, Palo Alto, CA 94304

Manufacturer	
Company Name	Hewlett Packard Enterprise Company
Address	3000 Hanover Street, Palo Alto, CA 94304

2. General Information

2.1. Description of Equipment Under Test (EUT)

<table>
<tr><th colspan="2">Product Feature & Specification</th></tr>
<tr><td>EUT Type</td><td>Wireless Access Point</td></tr>
<tr><td>Brand Name</td><td>aruba</td></tr>
<tr><td>Model Name</td><td>APIN0304, APIN0305</td></tr>
<tr><td>Marketing Name</td><td>APIN0304, APIN0305</td></tr>
<tr><td>FCC ID</td><td>Q9DAPIN0304305</td></tr>
<tr><td>Wireless Technology and Frequency Range</td><td>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz
WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz
WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz</td></tr>
<tr><td>Mode</td><td>· WLAN 2.4GHz 802.11b/g/n HT20/HT40
· WLAN 5GHz 802.11a/n HT20/HT40
· WLAN 5GHz 802.11ac VHT20/VHT40/VHT80
· Bluetooth v4.0 LE</td></tr>
<tr><td>Antenna Type</td><td>
<table>
<tr><th>Model Name</th><th colspan="2">Antenna Type</th></tr>
<tr><td rowspan="3">APIN0304</td><td rowspan="2">WLAN</td><td>Omnidirectional Antenna</td></tr>
<tr><td>Directional Antenna</td></tr>
<tr><td>Bluetooth</td><td>Internal Antenna</td></tr>
<tr><td rowspan="2">APIN0305</td><td>WLAN</td><td>Internal Antenna</td></tr>
<tr><td>Bluetooth</td><td>Internal Antenna</td></tr>
</table>
</td></tr>
<tr><td>SW Version</td><td>6.5.1.0 build56105</td></tr>
<tr><td>Antenna Function for Transmitter</td><td>
<APIN0304>:
<table>
<tr><th></th><th>BT antenna</th><th>Ant. 1</th><th>Ant. 2</th><th>Ant. 3</th></tr>
<tr><td>Bluetooth</td><td>V</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>WLAN 2.4GHz 802.11 b/g/n MIMO</td><td>-</td><td>-</td><td>V</td><td>V</td></tr>
<tr><td>WLAN 5GHz 802.11 a/n/ac MIMO</td><td>-</td><td>V</td><td>V</td><td>V</td></tr>
</table>
<APIN0305>:
<table>
<tr><th></th><th>Ant. 1</th><th>Ant. 2</th><th>Ant. 3</th></tr>
<tr><td>Bluetooth</td><td>-</td><td>V</td><td>-</td></tr>
<tr><td>WLAN 2.4GHz 802.11 b/g/n MIMO</td><td>V</td><td>-</td><td>V</td></tr>
<tr><td>WLAN 5GHz 802.11 a/n/ac MIMO</td><td>V</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>EUT Stage</td><td>Identical Prototype</td></tr>
<tr><td colspan="2">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. WLAN 2.4GHz and WLAN 5GHz can transmit in MIMO antenna mode only, and it has no SISO antenna mode.</td></tr>
</table>

2.2. Sample List

There are two model names of EUT. Model APIN0305 is designed with built in antennas, and model APIN0304 with three RP-SMA connectors for external antennas. For model APIN0304, it has nine types of antenna as below table:

	type	Description	Gain	Polorization
1	AP-ANT-1W	2.4-2.5GHz/5GHz, 5.0dBi Tri-Band, Omni-Directional Antenna	3.8dBi @2.4GHz; 5.8dB @5.8GHz	Linear vertical
2	AP-ANT-13B	downtilt omni, dual-band	4.4dBi @2.4GHz; 3.3dB @5.8GHz	Linear vertical
3	AP-ANT-19,	Dual Band Omnidirectional	3dBi @2.4GHz; 6dB @5.8GHz	vertical
4	AP-ANT-20W,	2.4- and 5-GHz dual-band omni directional	2dBi @2.4GHz; 2dB @5.8GHz	Linear vertical
5	AP-ANT-16,	Triple Element Downtilt Omni, Dual-Band	3.9dBi @2.4GHz; 4.7dB @5.8GHz	vertical
6	AP-ANT-25A	2.4- and 5-GHz dual polarized sector antenna	5dBi @2.4GHz; 5dB @5.8GHz	slant +/-45°
7	AP-ANT-35A	2.4- and 5-GHz dual polarized sector antenna	5dBi @2.4GHz; 5dB @5.8GHz	slant +/-45°
8	AP-ANT-28	2.4- and 5-GHz dual-polarized sector antenna	7.5dBi @2.4GHz; 7.5dB @5.8GHz	slant +/-45°
9	AP-ANT-38	2.4- and 5-GHz dual-polarized sector antenna	7.5dBi @2.4GHz; 7.5dB @5.8GHz	slant +/-45°

For model APIN0304, we only evaluate the antenna (AP-ANT-19 and AP-ANT-28) with the maximum antenna gain for MPE evaluation.

3. Maximum RF average output power among production units

<WLAN 2.4GHz>

Model Name	Mode	Maximum Average Power (dBm)
APIN0304	802.11b	21.5
	802.11g	21.0
	802.11n-HT20	17.0
	802.11n-HT40	17.0
APIN0305	802.11b	21.5
	802.11g	21.0
	802.11n-HT20	20.0
	802.11n-HT40	18.0

<WLAN 5GHz>

Model Name		Mode	Maximum Average Power (dBm)
APIN0304	WLAN 5.2GHz	802.11a	23.5
		802.11n-HT20	23.0
		802.11n-HT40	21.0
		802.11ac-VHT20	23.0
		802.11ac-VHT40	21.0
		802.11ac-VHT80	17.5
	WLAN 5.8GHz	802.11a	23.5
		802.11n-HT20	23.0
		802.11n-HT40	23.5
		802.11ac-VHT20	23.0
		802.11ac-VHT40	23.5
		802.11ac-VHT80	23.0
APIN0305	WLAN 5.2GHz	802.11a	23.5
		802.11n-HT20	23.0
		802.11n-HT40	21.5
		802.11ac-VHT20	23.0
		802.11ac-VHT40	21.5
		802.11ac-VHT80	19.5
	WLAN 5.8GHz	802.11a	23.5
		802.11n-HT20	23.0
		802.11n-HT40	23.5
		802.11ac-VHT20	23.0
		802.11ac-VHT40	23.5
		802.11ac-VHT80	23.0

<Bluetooth>

Model Name	Mode	Maximum Average Power (dBm)
APIN0304	Bluetooth v4.0 LE	0.5
APIN0305	Bluetooth v4.0 LE	0.5

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 20 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

Model Name	Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/mW^2)	Limit (mW/mW^2)	Power Density / Limit
APIN0304	WLAN 2.4GHz	2412.0	7.50	21.5	29.000	0.794	794.328	0.158	1.000	**0.158**
	WLAN 5.2GHz	5180.0	6.00	23.5	29.500	0.891	891.251	0.177	1.000	0.177
	WLAN 5.8GHz	5745.0	6.00	23.5	29.500	0.891	891.251	0.177	1.000	0.177
	Bluetooth	2402.0	4.50	0.5	5.000	0.003	3.162	0.001	1.000	**0.001**
APIN0305	WLAN 2.4GHz	2412.0	2.40	21.5	23.900	0.245	245.471	0.049	1.000	0.049
	WLAN 5.2GHz	5180.0	2.80	23.5	26.300	0.427	426.580	0.085	1.000	0.085
	WLAN 5.8GHz	5745.0	2.80	23.5	26.300	0.427	426.580	0.085	1.000	0.085
	Bluetooth	2402.0	3.40	0.5	3.900	0.002	2.455	0.000	1.000	**0.000**

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. In the above table have assessed WLAN 2.4GHz, WLAN 5GHz and Bluetooth by referring to their maximum antenna gain and maximum output power.

<For Beamforming mode>

Model Name	Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/mW^2)	Limit (mW/mW^2)	Power Density / Limit
APIN0304	WLAN 2.4GHz	2412.0	7.50	17.0	24.500	0.282	281.838	0.056	1.000	0.056
	WLAN 5.2GHz	5180.0	10.77	23.0	33.770	2.382	2382.319	0.474	1.000	0.474
	WLAN 5.8GHz	5745.0	10.77	23.5	34.270	2.673	2673.006	0.532	1.000	**0.532**
APIN0305	WLAN 2.4GHz	2412.0	5.41	20.0	25.410	0.348	347.536	0.069	1.000	**0.069**
	WLAN 5.2GHz	5180.0	7.57	23.0	30.570	1.140	1140.250	0.227	1.000	0.227
	WLAN 5.8GHz	5745.0	7.57	23.5	31.070	1.279	1279.381	0.255	1.000	**0.255**

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. This device support beamforming for WLAN 2.4GHz 802.11n HT20/HT40 and WLAN 5GHz 802.11n/ac HT20/HT40/VHT20/VHT40/VHT80.
3. In the above table have assessed WLAN 2.4GHz and WLAN 5GHz by referring to their maximum direction gain and maximum output power.
4. For model APIN0304 with WLAN 2.4GHz, the dual-polarized sector antenna with maximum antenna gain 7.5dBi which we choosed without beamforming antenna gain because of irrelevant of polarization. So for beamforming mode, we also use 7.5dBi to evaluate MPE test. For model APIN0304 with WLAN 5GHz on the maximum antenna gain 7.5dBi, the beamforming antenna gain is not equal to add 10log(3)=4.77 dBi but 3.01 dBi because of the dual-polarization. So we choose the secondary antenna with antenna gain 6dBi to evaluate MPE test.
5. For model APIN0305, composited gain for each antenna is 2.4dBi in 2.4GHz and 2.8dBi in 5GHz. And the beamforming gain is equal to each antenna add 10 log (N) dB, where N is the number of outputs.

5.2. Collocated Power Density Calculation

Model Name	Band	Maximum WLAN Power Density / Limit	Maximum Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WLAN 2.4GHz + WLAN 5GHz + Bluetooth
APIN0304	WLNA2.4GHz Band	0.158	0.001	0.691
	WLAN5GHz Band	0.532		
APIN0305	WLNA2.4GHz Band	0.069	0.000	0.324
	WLAN5GHz Band	0.255		

Note:

1. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN 2.4GHz+WLAN 5GHz + Bluetooth.
2. Considering the all antennas collocation of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant.

Conclusion:

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