IEEE C95.1 2005
KDB 447498 D01 V06
47 C.F.R. Part 1, Subpart I, Section 1.1310
47 C.F.R. Part 2, Subpart J, Section 2.1091

RF EXPOSURE REPORT

For

802.11ac Dual Band PoE Access Point

Model / Trade Name:

Model No.	Trade name
C-100	MOJO
	WatchGuard
WP8331	LITE-ON
AP220	WatchGuard

Issued to

Lite-On Technology Corp.
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

Issued by

Compliance Certification Services Inc.
Wugu Laboratory
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
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Issued Date: December 2, 2016

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		December 2, 2016		Initial Issue	ALL	Doris Chu
01		March 29, 2017		1. Modify model number. (AP200 change to AP220)	P.1, P.5	Angel Cheng

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1. TEST RESULT CERTIFICATION

We hereby certify that:

The equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirement of the applicable standards. The test record, data evaluation and Equipment under Test (EUT) configurations represented herein are true and accurate accounts of the measurement of the sample's RF characteristics under the conditions specified in this report.

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
IEEE C95.1 2005 KDB 447498 D03 47 C.F.R. Part 1, Subpart I, Section 1.1310 47 C.F.R. Part 2, Subpart J, Section 2.1091	No non-compliance noted

Approved by:

Sam Chuang
Manager
Compliance Certification Services Inc.

Prepared by:

Doris Chu
Report coordinator
Compliance Certification Services Inc.

2. LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

3. EUT SPECIFICATION

<table>
<tr><td>Product</td><td>802.11ac Dual Band PoE Access Point</td></tr>
<tr><td>Brand name / Model No.</td><td><table>
<tr><th>Model No.</th><th>Trade name</th></tr>
<tr><td rowspan="2">C-100</td><td>MOJO</td></tr>
<tr><td>WatchGuard</td></tr>
<tr><td>WP8331</td><td>LITE-ON</td></tr>
<tr><td>AP220</td><td>WatchGuard</td></tr>
</table></td></tr>
<tr><td>Model Discrepancy</td><td>All the specification and layout are identical except they come with different model numbers for marketing purposes.</td></tr>
<tr><td>Trade Name</td><td>MOJO, LITE-ON, WatchGuard</td></tr>
<tr><td>Frequency band (Operating)</td><td>☒ Bluetooth 2.1 + EDR / 4.0: 2402 MHz ~ 2480 MHz
802.11b/g/n HT20: 2412MHz ~ 2462MHz
802.11n HT40: 2422MHz ~ 2452MHz
802.11a/n HT20: 5180MHz ~ 5700MHz / 5745MHz ~ 5825MHz
802.11n HT40: 5190MHz ~ 5670MHz / 5755MHz ~ 5795MHz
802.11ac VHT 20: 5180MHz ~ 5700MHz / 5745MHz ~ 5825MHz
802.11ac VHT 40: 5190MHz ~ 5670MHz / 5755MHz ~ 5795MHz
802.11ac VHT 80: 5210MHz / 5775MHz
☐ Others</td></tr>
<tr><td>Device category</td><td>☐ Portable (<20cm separation)
☒ Mobile (>20cm separation)
☐ Others</td></tr>
<tr><td>Exposure classification</td><td>☐ Occupational/Controlled exposure (S = 5mW/cm^2)
☒ General Population/Uncontrolled exposure (S=1mW/cm^2)</td></tr>
</table>

<table>
<tr><td>Antenna Specification</td><td>BT
PIFA Antenna
Ant 5: Gain: 2.6 dBi
2.4G
PIFA Antenna
2G-1: Gain: 4.7dBi
2G-2: Gain: 3.3dBi
5G
PIFA Antenna
1. 5180-5240MHz
5G-1: Gain: 3.8dBi
5G-2: Gain: 5.0dBi
1. 5745-5825MHz
5G-1: Gain: 5.1dBi
5G-2: Gain: 4.1dBi

BT: Antenna Gain : 2.60 dBi (Numeric gain: 1.82) Worst
2.4GHz: Antenna Gain : 4.70 dBi (Numeric gain: 2.95) Worst
5GHz: Antenna Gain : 5.10 dBi (Numeric gain: 3.24) Worst

2.4GHz:
Directional gain = 4.70 dBi +10log (2) = 7.71 dBi (Numeric gain: 5.90)
5GHz:
Directional gain = 5.10 dBi +10log (2) = 8.11 dBi (Numeric gain: 6.47)</td></tr>
<tr><td>Maximum Average output power</td><td>Bluetooth Mode : 5.07 dBm (3.214 mW)
IEEE 802.11b Mode: 24.63 dBm (290.402 mW)
IEEE 802.11g Mode: 24.16 dBm (260.615 mW)
IEEE 802.11n HT 20 Mode: 24.34 dBm (271.644 mW)
IEEE 802.11n HT 40 Mode: 19.41 dBm (87.297 mW)
IEEE 802.11a Mode: 25.60 dBm (363.078 mW)
IEEE 802.11n HT 20 Mode: 25.07 dBm (321.366 mW)
IEEE 802.11n HT 40 Mode: 24.64 dBm (291.072 mW)
IEEE 802.11ac VHT 20 MHz: 24.97 dBm (314.051 mW)
IEEE 802.11ac VHT 40 MHz: 25.07 dBm (321.366 mW)
IEEE 802.11ac VHT 80 MHz: 22.88 dBm (194.089 mW)</td></tr>
</table>

Maximum Tune up Power	Bluetooth Mode : 6.00 dBm (3.981 mW) IEEE 802.11b Mode: 25.00 dBm (316.228 mW) IEEE 802.11g Mode: 25.00 dBm (316.228 mW) IEEE 802.11n HT 20 Mode: 25.00 dBm (316.228 mW) IEEE 802.11n HT 40 Mode: 20.00 dBm (100.000 mW) IEEE 802.11a Mode: 26.00 dBm (398.107 mW) IEEE 802.11n HT 20 Mode: 25.50 dBm (354.813 mW) IEEE 802.11n HT 40 Mode: 25.50 dBm (354.813 mW) IEEE 802.11ac VHT 20 MHz: 25.50 dBm (354.813 mW) IEEE 802.11ac VHT 40 MHz: 25.50 dBm (354.813 mW) IEEE 802.11ac VHT 80 MHz: 23.00 dBm (199.526 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

4. TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \dfrac{\sqrt{30 \times P \times G}}{d}$ & $S = \dfrac{E^2}{377}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

5. MAXIMUM PERMISSIBLE EXPOSURE

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

Bluetooth mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
39	2441	3.981	1.82	20	0.0014	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
1	2412	316.228	5.90	20	0.3713	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	316.228	5.90	20	0.3713	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	316.228	5.90	20	0.3713	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	100.000	5.90	20	0.1174	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
48	5240	398.107	6.47	20	0.5126	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
44	5220	354.813	6.47	20	0.4568	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
46	5230	354.813	6.47	20	0.4568	1

IEEE 802.11ac VHT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
48	5240	354.813	6.47	20	0.4568	1

IEEE 802.11ac VHT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
46	5230	354.813	6.47	20	0.4568	1

IEEE 802.11ac VHT 80 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
42	5210	199.526	6.47	20	0.2569	1

6. SIMULTANEOUS TRANSMISSION SAR ANALYSIS

Both of the 2.4GHz, 5GHz and BT can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + CPD3 / LPD3……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

BT+2.4GHz + 5GHz

Therefore, the worst-case situation is 0.0014 / 1 + 0.3713 / 1 + 0.5126 / 1= 0.8853, which is less than "1".