

RF Exposure Report

Report No.: SA151116E02

FCC ID: WBV-AP250

Test Model: AP250

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Release Control Record

Issue No.	Description	Date Issued
SA151116E02	Original release.	Mar. 29, 2016

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				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

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

where

Pd = power density in mW/cm²

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 32cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

The antennas provided to the EUT, please refer to the following table:

Radio 1									
WLAN - 2.4GHz + 5GHz									
Antenna NO.	Transmitter Circuit	Brand	Model No.	Ant. Gain (dBi) Including cable loss	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Loss(dB)	Cable Length
ANT1	Chain (0)	N/A	XKAA-N08	5.14 5.41 5.02 5.25 5.13	2.4~2.4835 5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	PIFA	i-pex (MHF)	0.21	54mm
ANT2	Chain (1)	N/A	XKAA-N08	4.28 4.82 5.16 5.14 5.31	2.4~2.4835 5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	PIFA	i-pex (MHF)	0.19	49mm
ANT3	Chain (2)	N/A	XKAA-N08	2.80 5.25 5.46 5.37 5.65	2.4~2.4835 5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	PIFA	i-pex (MHF)	0.39	101mm
Radio 2									
WLAN - 5GHz									
Antenna NO.	Transmitter Circuit	Brand	Model No.	Ant. Gain (dBi) Including cable loss	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Loss(dB)	Cable Length
ANT5	Chain (0)	N/A	XKAA-N08	5.32 5.78 5.26 5.3	5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	V-pol PIFA	i-pex (MHF)	0.82	213mm
ANT6	Chain (1)	N/A	XKAA-N08	5.54 5.72 5.56 5.1	5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	V-pol PIFA	i-pex (MHF)	0.25	66mm
ANT7	Chain (1)	N/A	XKAA-N08	5.24 6.38 5.36 5.27	5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	H-pol Dipole	i-pex (MHF)	0.58	150mm
ANT8	Chain (2)	N/A	XKAA-N08	4.88 4.27 4.84 5.19	5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	H-pol Dipole	i-pex (MHF)	0.77	201mm
ANT9	Chain (2)	N/A	XKAA-N08	4.41 4.55 4.79 4.87	5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.85	H-pol Dipole	i-pex (MHF)	0.73	190mm
Radio 3									
Bluetooth - 2.4GHz									
ANT4	Chain (0)	N/A	XKAA-N08	4.24	2.4~2.4835	Dipole	i-pex (MHF)	0.62	160mm

3 Calculation Result of Maximum Tune up Power

Radio 1

Frequency Band (MHz)	Max Tune up Power (dBm)	Max Tune up Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	27.77	598.411	8.9	32	0.36098	1
5180-5240	23.77	238.23	9.93	32	0.18217	1
5745-5825	24.77	299.916	10.14	32	0.24071	1

NOTE:

2412-2462MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G2/20})^2 / 3] = 8.9\text{dBi}$

5180-5240MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G2/20})^2 / 3] = 9.93\text{dBi}$

5745-5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G2/20})^2 / 3] = 10.14\text{dBi}$

Radio 2

Frequency Band (MHz)	Max Tune up Power (dBm)	Max Tune up Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
5180-5240	25.77	377.57	10.02	32	0.29477	1
5745-5825	25.77	377.57	9.97	32	0.29140	1

NOTE:

5180-5240MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G2/20})^2 / 3] = 10.02\text{dBi}$

5745-5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + 10^{G2/20})^2 / 3] = 9.97\text{dBi}$

Radio 3 (Bluetooth)

Frequency Band (MHz)	Max Tune up Power (dBm)	Max Tune up Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2402-2480	9	7.943	4.24	32	0.00164	1

Conclusion:

The formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.36098 / 1 + 0.29477 / 1 + 0.00164 / 1 = 0.65739$, which is less than "1".

This confirmed that the device comply with FCC 1.1310 MPE limit.

NOTE:

All radio technologies can transmit simultaneously, but Radio 1 & Radio 2 will not simultaneously in the same sub-band.

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