

RF Exposure Report

Report No.: SA190211C09B

FCC ID: 2AHBN-AP43

Test Model: AP43E, AP43

Received Date: Feb. 11, 2019

Test Date: Apr. 22, 2019 ~ Apr. 08, 2020

Issued Date: Apr. 15, 2020

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FCC Registration / 788550 / TW0003
Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
SA190211C09B	Original release	Apr. 15, 2020

1 Certificate of Conformity

Product: Premium 802.11ax WiFi and BLE AP

Brand: Mist

Test Model: AP43E, AP43

Sample Status: Engineering sample

Applicant: Mist Systems, Inc.

Test Date: Apr. 22, 2019 ~ Apr. 08, 2020

Standards: FCC Part 2 (Section 2.1091)

IEEE C95.3 -2002

References Test Guidance: KDB 447498 D01 General RF Exposure Guidance v06

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Apr. 15, 2020
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Apr. 15, 2020
Bruce Chen / Senior Project Engineer

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

$$P_d = (P_{out} * G) / (4 * \pi * r^2)$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 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 49cm away from the body of the user. So, this device is classified as **Mobile Device**.

3 Calculation Result of Maximum Conducted Power

WLAN

TX Function	Frequency Band (MHz)	Max AV Power (dBm)		Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)		Limit (mW/cm ²)
		CDD	Beamforming			CDD	Beamforming	
Internal antenna + Eth6 Radio								
1TX	5180-5240	21.62	-	5.90	49	0.019	-	1
	5260-5320	21.46	-	5.90	49	0.018	-	1
	5500-5700	21.51	-	5.90	49	0.018	-	1
	5745-5825	21.69	-	5.90	49	0.019	-	1
2TX	5180-5240	23.51	23.51	8.76	49	0.056	0.056	1
	5260-5320	23.06	20.81	8.76	49	0.050	0.030	1
	5500-5700	22.54	20.95	8.76	49	0.045	0.031	1
	5745-5825	23.37	23.37	8.76	49	0.054	0.054	1
3TX	5180-5240	23.55	23.55	10.41	49	0.082	0.082	1
	5260-5320	22.73	19.22	10.41	49	0.068	0.030	1
	5500-5700	23.06	19.17	10.41	49	0.074	0.030	1
	5745-5825	24.82	24.82	10.41	49	0.111	0.111	1
4TX	5180-5240	24.17	23.74	11.45	49	0.121	0.109	1
	5260-5320	20.78	17.97	11.45	49	0.055	0.029	1
	5500-5700	21.60	17.96	11.45	49	0.067	0.029	1
	5745-5825	25.94	23.72	11.45	49	0.182	0.109	1
Internal antenna + Eth7 Radio								
1TX	2412-2462	19.18	-	2.70	49	0.005	-	1
	5180-5240	22.92	-	5.60	49	0.024	-	1
	5745-5825	23.28	-	5.60	49	0.026	-	1
2TX	2412-2462	21.86	-	5.51	49	0.018	-	1
	5180-5240	25.38	-	8.46	49	0.080	-	1
	5745-5825	25.43	-	8.46	49	0.081	-	1

TX Function	Frequency Band (MHz)	Max AV Power (dBm)		Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm²)		Limit (mW/cm²)
		CDD	Beamforming			CDD	Beamforming	
Internal antenna + Eth8 Radio								
1TX	2412-2462	19.32	-	4.30	49	0.008	-	1
	5500-5700	21.61	-	5.60	49	0.017	-	1
	5745-5825	21.66	-	5.60	49	0.018	-	1
2TX	2412-2462	23.59	23.31	7.16	49	0.039	0.037	1
	5500-5700	22.50	20.78	8.32	49	0.040	0.027	1
	5745-5825	25.34	25.34	8.32	49	0.077	0.077	1
3TX	2412-2462	25.28	24.91	8.59	49	0.081	0.074	1
	5500-5700	23.28	18.53	9.75	49	0.067	0.022	1
	5745-5825	27.12	25.52	9.75	49	0.161	0.112	1
4TX	2412-2462	25.44	25.10	9.37	49	0.100	0.093	1
	5500-5700	23.95	18.54	10.96	49	0.103	0.030	1
	5745-5825	28.52	24.53	10.96	49	0.294	0.117	1

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Internal antenna + Eth6 Radio

For 2TX

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 8.76\text{dBi}$

For 3TX

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/3] = 10.41\text{dBi}$

For 4TX

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 11.45\text{dBi}$

Internal antenna + Eth7 Radio

For 2TX

2.4GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.51\text{dBi}$

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 8.46\text{dBi}$

Internal antenna + Eth8 Radio

For 2TX

2.4GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 7.16\text{dBi}$

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 8.32\text{dBi}$

For 3TX

2.4GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/3] = 8.59\text{dBi}$

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/3] = 9.75\text{dBi}$

For 4TX

2.4GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 9.37\text{dBi}$

5GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 10.96\text{dBi}$

TX Function	Frequency Band (MHz)	Max AV Power (dBm)		Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm²)		Limit (mW/cm²)
		CDD	Beamforming			CDD	Beamforming	
External antenna – PN: ATS-OO-245-46-4RPSP-36 + Eth6 Radio								
1TX	5180-5240	21.62	-	6.00	49	0.019	-	1
	5260-5320	21.46	-	6.00	49	0.018	-	1
	5500-5700	21.51	-	6.00	49	0.019	-	1
	5745-5825	21.69	-	6.00	49	0.019	-	1
2TX	5180-5240	23.51	23.51	9.01	49	0.059	0.059	1
	5260-5320	23.06	20.81	9.01	49	0.053	0.032	1
	5500-5700	22.54	20.95	9.01	49	0.047	0.033	1
	5745-5825	23.37	23.37	9.01	49	0.057	0.057	1
3TX	5180-5240	23.55	23.55	10.77	49	0.090	0.090	1
	5260-5320	22.73	19.22	10.77	49	0.074	0.033	1
	5500-5700	23.06	19.17	10.77	49	0.080	0.033	1
	5745-5825	24.82	24.82	10.77	49	0.120	0.120	1
4TX	5180-5240	24.17	23.74	12.02	49	0.138	0.125	1
	5260-5320	20.78	17.97	12.02	49	0.063	0.033	1
	5500-5700	21.60	17.96	12.02	49	0.076	0.033	1
	5745-5825	25.94	23.72	12.02	49	0.207	0.124	1
External antenna – PN: ATS-OO-245-46-4RPSP-36 + Eth7 Radio								
1TX	2412-2462	19.18	-	4.00	49	0.007	-	1
	5180-5240	22.92	-	6.00	49	0.026	-	1
	5745-5825	23.28	-	6.00	49	0.028	-	1
2TX	2412-2462	21.88	-	7.01	49	0.026	-	1
	5180-5240	25.38	-	9.01	49	0.091	-	1
	5745-5825	25.43	-	9.01	49	0.092	-	1
External antenna – PN: ATS-OO-245-46-4RPSP-36 + Eth8 Radio								
1TX	2412-2462	19.32	-	4.00	49	0.007	-	1
2TX	2412-2462	22.52	22.07	7.01	49	0.030	0.027	1
3TX	2412-2462	23.87	23.78	8.77	49	0.061	0.060	1
4TX	2412-2462	25.44	25.10	10.02	49	0.117	0.108	1

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

External antenna – PN: ATS-OO-245-46-4RPSP-36 + Eth6 Radio

For 2TX

5GHz: Directional gain = 6dBi + $10\log(2)$ = 9.01dBi

For 3TX

5GHz: Directional gain = 6dBi + $10\log(3)$ = 10.77dBi

For 4TX

5GHz: Directional gain = 6dBi + $10\log(4)$ = 12.02dBi

External antenna – PN: ATS-OO-245-46-4RPSP-36 + Eth7 Radio

For 2TX

2.4GHz: Directional gain = 4dBi + $10\log(2)$ = 7.01dBi

5GHz: Directional gain = 6dBi + $10\log(2)$ = 9.01dBi

External antenna – PN: ATS-OO-245-46-4RPSP-36 + Eth8 Radio

For 2TX

2.4GHz: Directional gain = 4dBi + $10\log(2)$ = 7.01dBi

For 3TX

2.4GHz: Directional gain = 4dBi + $10\log(3)$ = 8.77dBi

For 4TX

2.4GHz: Directional gain = 4dBi + $10\log(4)$ = 10.02dBi

TX Function	Frequency Band (MHz)	Max AV Power (dBm)		Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm²)		Limit (mW/cm²)
		CDD	Beamforming			CDD	Beamforming	
External antenna – PN: ATS-OP-245-810-4RPSP-36 + Eth6 Radio								
1TX	5180-5240	23.16	-	10.00	49	0.069	-	1
	5260-5320	19.97	-	10.00	49	0.033	-	1
	5500-5700	19.45	-	10.00	49	0.029	-	1
	5745-5825	20.31	-	10.00	49	0.036	-	1
2TX	5180-5240	23.35	22.92	13.01	49	0.143	0.130	1
	5260-5320	19.88	16.89	13.01	49	0.064	0.032	1
	5500-5700	19.51	16.97	13.01	49	0.059	0.033	1
	5745-5825	23.33	22.85	13.01	49	0.143	0.128	1
3TX	5180-5240	23.09	21.07	14.77	49	0.202	0.127	1
	5260-5320	19.97	15.22	14.77	49	0.099	0.033	1
	5500-5700	19.29	15.20	14.77	49	0.084	0.033	1
	5745-5825	25.41	20.83	14.77	49	0.345	0.120	1
4TX	5180-5240	24.86	19.75	16.02	49	0.406	0.125	1
	5260-5320	19.36	13.94	16.02	49	0.114	0.033	1
	5500-5700	19.33	13.97	16.02	49	0.114	0.033	1
	5745-5825	25.94	19.95	16.02	49	0.520	0.131	1
External antenna – PN: ATS-OP-245-810-4RPSP-36 + Eth7 Radio								
1TX	2412-2462	19.18	-	8.00	49	0.017	-	1
	5180-5240	20.68	-	10.00	49	0.039	-	1
	5745-5825	20.31	-	10.00	49	0.036	-	1
2TX	2412-2462	22.12	-	11.01	49	0.068	-	1
	5180-5240	24.17	-	13.01	49	0.173	-	1
	5745-5825	23.30	-	13.01	49	0.142	-	1
External antenna – PN: ATS-OP-245-810-4RPSP-36 + Eth8 Radio								
1TX	2412-2462	19.32	-	8.00	49	0.018	-	1
2TX	2412-2462	22.52	22.07	11.01	49	0.075	0.067	1
3TX	2412-2462	25.42	23.14	12.77	49	0.218	0.129	1
4TX	2412-2462	25.44	21.79	14.02	49	0.293	0.126	1

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

External antenna – PN: ATS-OP-245-810-4RPSP-36 + Eth6 Radio

For 2TX

5GHz: Directional gain = $10\text{dBi} + 10\log(2) = 13.01\text{dBi}$

For 3TX

5GHz: Directional gain = $10\text{dBi} + 10\log(3) = 14.77\text{dBi}$

For 4TX

5GHz: Directional gain = $10\text{dBi} + 10\log(4) = 16.02\text{dBi}$

External antenna – PN: ATS-OP-245-810-4RPSP-36 + Eth7 Radio

For 2TX

2.4GHz: Directional gain = $8\text{dBi} + 10\log(2) = 11.01\text{dBi}$

5GHz: Directional gain = $10\text{dBi} + 10\log(2) = 13.01\text{dBi}$

External antenna – PN: ATS-OP-245-810-4RPSP-36 + Eth8 Radio

For 2TX

2.4GHz: Directional gain = $8\text{dBi} + 10\log(2) = 11.01\text{dBi}$

For 3TX

2.4GHz: Directional gain = $8\text{dBi} + 10\log(3) = 12.77\text{dBi}$

For 4TX

2.4GHz: Directional gain = $8\text{dBi} + 10\log(4) = 14.02\text{dBi}$

BT LE

TX Function	Frequency Band (MHz)	Max AV Power (dBm)		Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)		Limit (mW/cm ²)
		CDD	Beamforming			CDD	Beamforming	
BT LE Radio (BT-Omni Mode)								
1TX	2402-2480	4.01	-	0.10	49	0.0001	-	1
BT LE Radio (BT-Directional Mode)								
1TX	2402-2480	4.01	-	4.50	49	0.0002	-	1

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Conclusion:

The Eth6 Radio & Eth7 Radio & Eth8 Radio & BT LE Radio can transmit simultaneously, but will not simultaneously in the same sub-band, the formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

AP43 (Internal antenna): Eth6 Radio WLAN + Eth7 Radio WLAN + Eth8 Radio WLAN + BT LE = $0.182 / 1 + 0.081 / 1 + 0.294 / 1 + 0.0004 / 1 = 0.5574$

AP43E (External antenna – PN: ATS-OO-245-46-4RPSP-36): Eth6 Radio WLAN + Eth7 Radio WLAN + Eth8 Radio WLAN + BT LE = $0.207 / 1 + 0.092 / 1 + 0.117 / 1 + 0.0002 / 1 = 0.4162$

AP43E (External antenna – PN: ATS-OP-245-810-4RPSP-36): Eth6 Radio WLAN + Eth7 Radio WLAN + Eth8 Radio WLAN + BT LE = $0.520 / 1 + 0.173 / 1 + 0.293 / 1 + 0.0002 / 1 = 0.9862$

Therefore the maximum calculations of above situations are less than the “1” limit.

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