RF Exposure Report

Report No.:	SA170912E01D
FCC ID:	2AHBN-AP61
Test Model:	AP61E, AP61
Received Date:	Sep. 14, 2017
Test Date:	Oct. 17 to 24, 2017
Issued Date:	Jan. 04, 2018

Applicant:	Mist Systems, Inc.
Address:	1601 South De Anza Blvd. Suite 248 Cupertino California United States 95014

Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
SA170912E01D	Original release.	Jan. 04, 2018

1 Certificate of Conformity

Product:	Premium Outdoor Wi-Fi & BLE Array AP
Brand:	Mist
Test Model:	AP61E, AP61
Sample Status:	ENGINEERING SAMPLE
Applicant:	Mist Systems, Inc.
Test Date:	Oct. 17 to 24, 2017
Standards:	FCC Part 2 (Section 2.1091) KDB 447498 D01 General RF Exposure Guidance v06 IEEE C95.1-1992

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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jan. 04, 2018

Wendy Wu / Specialist

Approved by : _____ , **Date:** Jan. 04, 2018

May Chen / Manager

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				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

f = Frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

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

where

Pd = power density in mW/cm^2

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

For Model No.: AP61					
Radio 1- WLAN - 2.4GHz + 5GHz (Internal antenna)					
Antenna Set	Transmitter Circuit	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
1	Chain (0)	3.87	2.4~2.4835	PIFA	i-pex(MHF)
		4.94	5.15~5.25		
		4.66	5.25~5.35		
		4.25	5.47~5.725		
		4.42	5.725~5.85		
	Chain (1)	3.91	2.4~2.4835	PIFA	i-pex(MHF)
		4.23	5.15~5.25		
		4.54	5.25~5.35		
		4.66	5.47~5.725		
		4.70	5.725~5.85		
	Chain (2)	3.93	2.4~2.4835	PIFA	i-pex(MHF)
		4.53	5.15~5.25		
		4.86	5.25~5.35		
		4.95	5.47~5.725		
		4.94	5.725~5.85		
	Chain (3)	3.81	2.4~2.4835	PIFA	i-pex(MHF)
		4.50	5.15~5.25		
		4.92	5.25~5.35		
		4.71	5.47~5.725		
		4.90	5.725~5.85		

Radio 2- WLAN RX only - 2.4GHz + 5GHz (Scanning radio antenna)				
Antenna No.	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
1	3.85	2.4~2.4835	PIFA	i-pex(MHF)
	4.61	5.15~5.25		
	4.71	5.25~5.35		
	4.72	5.47~5.725		
	4.73	5.725~5.85		

Radio 3 - Bluetooth				
Antenna No.	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
1	3.56	2.4~2.4835	Omni	i-pex(MHF)
2	5.01	2.4~2.4835	Patch	i-pex(MHF)

For Model No.: AP61E

Radio 1 - WLAN - 2.4GHz + 5GHz (External antenna)

Antenna Set	Transmitter Circuit	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
1	Chain (0)	PCTEL	FPMI2458-DP4NM	6	2.4~2.4835	Sector	R-N Type
				5	5.15~5.25		
				5	5.25~5.35		
				5	5.47~5.725		
				5	5.725~5.85		
	Chain (1)	PCTEL	FPMI2458-DP4NM	6	2.4~2.4835	Sector	R-N Type
				5	5.15~5.25		
				5	5.25~5.35		
				5	5.47~5.725		
				5	5.725~5.85		
	Chain (2)	PCTEL	FPMI2458-DP4NM	6	2.4~2.4835	Sector	R-N Type
				5	5.15~5.25		
				5	5.25~5.35		
				5	5.47~5.725		
				5	5.725~5.85		
	Chain (3)	PCTEL	FPMI2458-DP4NM	6	2.4~2.4835	Sector	R-N Type
				5	5.15~5.25		
				5	5.25~5.35		
				5	5.47~5.725		
				5	5.725~5.85		
Antenna Set	Transmitter Circuit	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
2	Chain (0)	PCTEL	MPMI2458-4-NM	4	2.4~2.4835	Omnidirectional	R-N Type
				4	5.15~5.25		
				4	5.25~5.35		
				4	5.47~5.725		
				4	5.725~5.85		
	Chain (1)	PCTEL	MPMI2458-4-NM	4	2.4~2.4835	Omnidirectional	R-N Type
				4	5.15~5.25		
				4	5.25~5.35		
				4	5.47~5.725		
				4	5.725~5.85		
	Chain (2)	PCTEL	MPMI2458-4-NM	4	2.4~2.4835	Omnidirectional	R-N Type
				4	5.15~5.25		
				4	5.25~5.35		
				4	5.47~5.725		
				4	5.725~5.85		
	Chain (3)	PCTEL	MPMI2458-4-NM	4	2.4~2.4835	Omnidirectional	R-N Type
				4	5.15~5.25		
				4	5.25~5.35		
				4	5.47~5.725		
				4	5.725~5.85		

Radio 2 - WLAN RX only - 2.4GHz + 5GHz (Scanning radio antenna)					
Antenna No.	Transmitter Circuit	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
1	Chain (0)	3.85	2.4~2.4835	PIFA	i-pex(MHF)
		4.61	5.15~5.25		
		4.71	5.25~5.35		
		4.72	5.47~5.725		
		4.73	5.725~5.85		
Radio 3 - Bluetooth					
Antenna No.	Transmitter Circuit	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecter Type
1	Chain (0)	3.56	2.4~2.4835	Omni	i-pex(MHF)
2	Chain (1)	5.01	2.4~2.4835	Patch	i-pex(MHF)

Note:
1. For antennas of radio 2 & 3, Model No.: AP61 is as same as AP61E

2.5 Calculation Result of Maximum Conducted Power

For 2.4GHz, 5GHz (U-NII-1 & UNII-3 band) and Bluetooth data was copied from the original test report (Report No.: SA170912E01A)

For WLAN (with External antenna):

Frequency Band (MHz)	Max. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2412-2462	564.245	12.02	32	0.69816	1
5180-5240 (4TX)	39.684	11.02	32	0.03900	1
5260-5320 (4TX)	78.489	11.02	32	0.07714	1
5260-5320 (3TX)	105.248	9.77	32	0.07757	1
5260-5320 (2TX)	156.699	8.01	32	0.07701	1
5260-5320 (1TX)	248.886	5.00	32	0.06116	1
5500-5720 (4TX)	78.915	11.02	32	0.07756	1
5500-5720 (3TX)	105.311	9.77	32	0.07762	1
5502-5720 (2TX)	156.724	8.01	32	0.07702	1
5500-5720 (1TX)	218.273	5.00	32	0.05364	1
5745-5825 (4TX)	864.747	11.02	32	0.84992	1

NOTE:
2.4GHz: Directional gain = 6dBi + 10log(4) = 12.02dBi
5GHz
4TX: Directional gain = 5dBi + 10log(4) = 11.02dBi
3TX: Directional gain = 5dBi + 10log(3) = 9.77dBi
2TX: Directional gain = 5dBi + 10log(2) = 8.01dBi

For WLAN (with Internal antenna):

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2412-2462	631.677	9.90	32	0.47972	1
5180-5240 (1TX)	40.272	4.94	32	0.00976	1
5180-5240 (4TX)	39.684	9.90	32	0.03516	1
5260-5320 (4TX)	78.489	10.77	32	0.07283	1
5260-5320 (3TX)	105.248	9.59	32	0.07442	1
5260-5320 (2TX)	156.699	7.90	32	0.07509	1
5260-5320 (1TX)	248.886	4.92	32	0.06005	1
5500-5720 (4TX)	105.311	10.67	32	0.09549	1
5500-5720 (3TX)	156.724	9.55	32	0.10981	1
5500-5720 (2TX)	218.273	7.84	32	0.10315	1
5500-5720 (1TX)	864.747	4.95	32	0.21008	1
5745-5825 (4TX)	957.748	10.76	32	0.88663	1

NOTE:

2.4GHz: Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 4] = 9.90dBi$

5GHz:

UNII-2A:

4TX: Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 4] = 10.77dBi$

3TX: Directional gain = $10 \log[(10^{G0/20} + 10^{G2/20} + 10^{G3/20})^2 / 3] = 9.59dBi$

2TX: Directional gain = $10 \log[(10^{G2/20} + 10^{G3/20})^2 / 2] = 7.90dBi$

UNII-2C:

4TX: Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 4] = 10.67dBi$

3TX: Directional gain = $10 \log[(10^{G0/20} + 10^{G2/20} + 10^{G3/20})^2 / 3] = 9.55dBi$

2TX: Directional gain = $10 \log[(10^{G2/20} + 10^{G3/20})^2 / 2] = 7.84dBi$

UNII-3: Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 4] = 10.76dBi$

For BT-EDR:

Frequency Band (MHz)	Max. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	10.375	5.01	32	0.00256	1

For BT-LE:

Frequency Band (MHz)	Max. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	6.622	5.01	32	0.00163	1

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

For Model No.: AP61E

WLAN 2.4GHz + Bluetooth = 0.69816 / 1 + 0.00256 / 1 = 0.70072

WLAN 5GHz + Bluetooth = 0.84992 / 1 + 0.00256 / 1 = 0.85248

For Model No.: AP61

WLAN 2.4GHz + Bluetooth = 0.47972 / 1 + 0.00256 / 1 = 0.48228

WLAN 5GHz + Bluetooth = 0.88663 / 1 + 0.00256 / 1 = 0.88919

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

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