

## 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.

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by any government agencies.

## Table of Contents

<b>Release Control Record</b> .....	<b>3</b>
<b>1 Certificate of Conformity</b> .....	<b>4</b>
<b>2 RF Exposure</b> .....	<b>5</b>
2.1 Limits for Maximum Permissible Exposure (MPE) .....	5
2.2 MPE Calculation Formula .....	5
2.3 Classification .....	5
2.4 Antenna Gain .....	6
2.5 Calculation Result of Maximum Conducted Power .....	9

### 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 :** Wendy Wu , **Date:** Jan. 04, 2018  
Wendy Wu / Specialist

**Approved by :** May Chen , **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 <sup>2</sup> )	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 <sup>2</sup> )*	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<sup>2</sup>

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	Connector 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	Connector 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	Connector 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	Connector 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			
	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			
	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				
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			
	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			
	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	Connector 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	Connector 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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
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 =  $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 4] = 9.90\text{dBi}$

5GHz:

**UNII-2A:**

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

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

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

**UNII-2C:**

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

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

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

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

**For BT-EDR:**

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

**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.**

--- END ---