

## RF Exposure Report

**Report No.:** SA170417C09C

**FCC ID:** 2AKCZ-0C1

**Test Model:** APL42-0C1

**Received Date:** Sep. 29, 2017

**Test Date:** Oct. 11 ~ Nov. 17, 2017

**Issued Date:** Dec. 01, 2017

**Applicant:** SonicWall Inc.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)



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### Release Control Record

Issue No.	Description	Date Issued
SA170417C09C	Original release.	Dec. 01, 2017

## 1 Certificate of Conformity

**Product:** Wireless Access Point

**Brand:** SONICWALL

**Test Model:** APL42-0C1

**Sample Status:** Engineering sample

**Applicant:** SonicWall Inc.

**Test Date:** Oct. 11 ~ Nov. 17, 2017

**Standards:** FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.1

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:** Dec. 01, 2017  
Pettie Chen / Senior Specialist

**Approved by :**  , **Date:** Dec. 01, 2017  
Ken Liu / Senior 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				
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/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 58cm away from the body of the user. So, this device is classified as Mobile Device.

### 3 Calculation Result of Maximum Conducted Power

Ant. Type	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
Radio 1						
Dipole	WLAN 2412~2462 (CDD mode)	28.14	10.52	58	0.174	1
	WLAN 2412~2462 (Beamforming mode)	21.16	10.52	58	0.035	1
Sector	WLAN 2412~2462 (CDD mode)	23.31	18.27	58	0.340	1
	WLAN 2412~2462 (Beamforming mode)	17.29	18.27	58	0.085	1
Panel (Model: P254-07)	WLAN 2412~2462 (CDD mode)	27.16	13.87	58	0.300	1
	WLAN 2412~2462 (Beamforming mode)	20.77	13.87	58	0.069	1
Panel (Model: P254-13)	WLAN 2412~2462 (CDD mode)	22.85	18.37	58	0.313	1
	WLAN 2412~2462 (Beamforming mode)	16.83	18.37	58	0.078	1
Panel (Model: P254-09)	WLAN 2412~2462 (CDD mode)	26.28	15.17	58	0.330	1
	WLAN 2412~2462 (Beamforming mode)	19.21	15.17	58	0.065	1
Panel (Model: P124-10)	WLAN 2412~2462 (CDD mode)	26.28	15.67	58	0.371	1
	WLAN 2412~2462 (Beamforming mode)	19.74	15.67	58	0.082	1

Ant. Type	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
Radio 2						
Dipole	WLAN 5180~5240 (CDD mode)	24.79	12.32	58	0.122	1
	WLAN 5260~5320 (CDD mode)	18.71	12.32	58	0.030	1
	WLAN 5500~5700 (CDD mode)	18.65	12.32	58	0.030	1
	WLAN 5745~5825 (CDD mode)	27.75	12.32	58	0.240	1
	WLAN 5180~5240 (Beamforming mode)	18.52	12.32	58	0.029	1
	WLAN 5260~5320 (Beamforming mode)	12.69	12.32	58	0.007	1
	WLAN 5500~5700 (Beamforming mode)	12.63	12.32	58	0.007	1
	WLAN 5745~5825 (Beamforming mode)	21.69	12.32	58	0.060	1
Sector	WLAN 5180~5240 (CDD mode)	13.90	19.97	58	0.058	1
	WLAN 5260~5320 (CDD mode)	14.45	19.97	58	0.065	1
	WLAN 5500~5700 (CDD mode)	15.34	19.97	58	0.080	1
	WLAN 5745~5825 (CDD mode)	21.37	19.97	58	0.322	1
	WLAN 5180~5240 (Beamforming mode)	7.87	19.97	58	0.014	1
	WLAN 5260~5320 (Beamforming mode)	8.43	19.97	58	0.016	1
	WLAN 5500~5700 (Beamforming mode)	9.32	19.97	58	0.020	1
	WLAN 5745~5825 (Beamforming mode)	15.35	19.97	58	0.081	1
Panel (Model: P254-07)	WLAN 5180~5240 (CDD mode)	11.37	16.17	58	0.013	1
	WLAN 5260~5320 (CDD mode)	19.06	16.17	58	0.079	1
	WLAN 5500~5700 (CDD mode)	17.05	16.17	58	0.050	1
	WLAN 5745~5825 (CDD mode)	25.30	16.17	58	0.332	1
	WLAN 5180~5240 (Beamforming mode)	5.29	16.17	58	0.003	1
	WLAN 5260~5320 (Beamforming mode)	13.04	16.17	58	0.020	1
	WLAN 5500~5700 (Beamforming mode)	11.03	16.17	58	0.012	1
	WLAN 5745~5825 (Beamforming mode)	19.28	16.17	58	0.083	1

Ant. Type	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
Panel (Model: P254-13)	WLAN 5180~5240 (CDD mode)	8.44	19.97	58	0.016	1
	WLAN 5260~5320 (CDD mode)	15.25	19.97	58	0.079	1
	WLAN 5500~5700 (CDD mode)	15.08	19.97	58	0.076	1
	WLAN 5745~5825 (CDD mode)	21.37	19.97	58	0.322	1
	WLAN 5180~5240 (Beamforming mode)	2.42	19.97	58	0.004	1
	WLAN 5260~5320 (Beamforming mode)	9.23	19.97	58	0.020	1
	WLAN 5500~5700 (Beamforming mode)	9.06	19.97	58	0.019	1
	WLAN 5745~5825 (Beamforming mode)	15.35	19.97	58	0.081	1
Panel (Model: P254-09)	WLAN 5180~5240 (CDD mode)	15.11	16.08	58	0.031	1
	WLAN 5260~5320 (CDD mode)	18.91	16.08	58	0.075	1
	WLAN 5500~5700 (CDD mode)	17.53	16.08	58	0.054	1
	WLAN 5745~5825 (CDD mode)	25.59	16.08	58	0.347	1
	WLAN 5180~5240 (Beamforming mode)	9.00	16.08	58	0.008	1
	WLAN 5260~5320 (Beamforming mode)	12.89	16.08	58	0.019	1
	WLAN 5500~5700 (Beamforming mode)	11.51	16.08	58	0.014	1
	WLAN 5745~5825 (Beamforming mode)	19.37	16.08	58	0.083	1
Panel (Model: P154-12)	WLAN 5180~5240 (CDD mode)	18.63	18.80	58	0.131	1
	WLAN 5260~5320 (CDD mode)	15.32	18.80	58	0.061	1
	WLAN 5500~5700 (CDD mode)	15.34	18.80	58	0.061	1
	WLAN 5745~5825 (CDD mode)	23.18	18.80	58	0.373	1
	WLAN 5180~5240 (Beamforming mode)	12.61	18.80	58	0.033	1
	WLAN 5260~5320 (Beamforming mode)	9.30	18.80	58	0.015	1
	WLAN 5500~5700 (Beamforming mode)	9.32	18.80	58	0.015	1
	WLAN 5745~5825 (Beamforming mode)	16.99	18.80	58	0.090	1
Radio 3						
Scanning Antenna	WLAN 2412~2462	21.12	3.15	58	0.006	1
Radio 4						
BLE Antenna	BT LE 2402~2480	4.81	3.37	58	0.0002	1



Note:

2.4GHz:

Dipole antenna, Directional gain =  $4.5\text{dBi} + 10\log(4) = 10.52\text{dBi}$

Sector antenna, Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 18.27\text{dBi}$

Panel antenna (Model: P254-07), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 13.87\text{dBi}$

Panel antenna (Model: P254-13), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 18.37\text{dBi}$

Panel antenna (Model: P254-09), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 15.17\text{dBi}$

Panel antenna (Model: P124-10), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 15.67\text{dBi}$

5.0GHz:

Dipole antenna, Directional gain =  $6.3\text{dBi} + 10\log(4) = 12.32\text{dBi}$

Sector antenna, Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 19.97\text{dBi}$

Panel antenna (Model: P254-07), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 16.17\text{dBi}$

Panel antenna (Model: P254-13), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 19.97\text{dBi}$

Panel antenna (Model: P254-09), Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/4] = 16.08\text{dBi}$

Panel antenna (Model: P124-10), Directional gain =  $12.78\text{dBi} + 10\log(4) = 18.80\text{dBi}$

Dipole					
Frequency Band	Max. Power (dBm)			Total Power (dBm)	Power Limit (dBm)
	Radio 1	Radio 3	Radio 4		
2.4GHz	28.14	21.12	4.81	28.94	30

Sector					
Frequency Band	Max. Power (dBm)			Total Power (dBm)	Power Limit (dBm)
	Radio 1	Radio 3	Radio 4		
2.4GHz	23.31	21.12	4.81	25.40	30

Panel (Model: P254-07)					
Frequency Band	Max. Power (dBm)			Total Power (dBm)	Power Limit (dBm)
	Radio 1	Radio 3	Radio 4		
2.4GHz	27.16	21.12	4.81	28.15	30

Panel (Model: P254-13)					
Frequency Band	Max. Power (dBm)			Total Power (dBm)	Power Limit (dBm)
	Radio 1	Radio 3	Radio 4		
2.4GHz	22.85	21.12	4.81	25.12	30

Panel (Model: P254-09)					
Frequency Band	Max. Power (dBm)			Total Power (dBm)	Power Limit (dBm)
	Radio 1	Radio 3	Radio 4		
2.4GHz	26.28	21.12	4.81	27.46	30

Panel (Model: P124-10)					
Frequency Band	Max. Power (dBm)			Total Power (dBm)	Power Limit (dBm)
	Radio 1	Radio 3	Radio 4		
2.4GHz	26.28	21.12	4.81	27.46	30

**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

Radio 1 (Dipole) + Radio 2 (Dipole) + Radio 3 + Radio 4  
=  $0.174 + 0.240 + 0.006 + 0.0002 = 0.420 < 1$

Radio 1 (Sector) + Radio 2 (Sector) + Radio 3 + Radio 4  
=  $0.340 + 0.322 + 0.006 + 0.0002 = 0.668 < 1$

Radio 1 (Panel (Model: P254-07)) + Radio 2 (Panel (Model: P254-07)) + Radio 3 + Radio 4  
=  $0.300 + 0.332 + 0.006 + 0.0002 = 0.638 < 1$

Radio 1 (Panel (Model: P254-13)) + Radio 2 (Panel (Model: P254-13)) + Radio 3 + Radio 4  
=  $0.313 + 0.322 + 0.006 + 0.0002 = 0.641 < 1$

Radio 1 (Panel (Model: P254-09)) + Radio 2 (Panel (Model: P254-09)) + Radio 3 + Radio 4  
=  $0.330 + 0.347 + 0.006 + 0.0002 = 0.683 < 1$

Radio 1 (Panel (Model: P124-10)) + Radio 2 (Panel (Model: P154-12)) + Radio 3 + Radio 4  
=  $0.371 + 0.373 + 0.006 + 0.0002 = 0.750 < 1$

**---END---**