



# RF EXPOSURE REPORT

**REPORT NO.:** SA971006L02

**MODEL NO.:** APL20-065

**ACCORDING:** FCC Guidelines for Human Exposure  
IEEE C95.1

**APPLICANT:** Sonicwall, Inc.

**ADDRESS:** 1143 Borregas Ave. Sunnyvale CA 94089-1306  
USA

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

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou  
Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
Shan Hsiang, Taoyuan Hsien 333, Taiwan,  
R.O.C.



## RF EXPOSURE MEASUREMENT (MOBILE DEVICE)

### 1. INTRODUCTION

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Fully Anechoic Chamber (FAC) calibrated for antenna measurement in ADT, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

### 2. RF EXPOSURE LIMIT

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

#### 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)
<b>(A)LIMITS FOR OCCUPATIONAL / CONTROL EXPOSURES</b>				
300-1500	...	...	F/300	6
1500-100,000	...	...	5	6
<b>(B)LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE</b>				
300-1500	...	...	F/1500	30
1500-100,000	...	...	1.0	30

F = Frequency in MHz



### 3. FRIIS FORMULA

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

where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = 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

If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance  $r$ .

Ref.: David K. Cheng, *Field and Wave Electromagnetics*, Second Edition,

Page 640, Eq. (11-133).

### 4. EUT OPERATING CONDITION

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

### 5. CLASSIFICATION

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in users manual. So, this device is classified as **Mobile Device**.



## 6. TEST RESULTS

### 6.1 ANTENNA GAIN

The maximum Gain measured in Fully Anechoic Chamber is 5dBi or 3.162(numeric).

### 6.2 OUTPUT POWER INTO ANTENNA & RF EXPOSURE VALUE AT DISTANCE 20cm:

#### 802.11b DSSS MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/cm <sup>2</sup> )
		CHAIN 0	CHAIN 1	CHAIN 2				
1	2412	17.08	16.56	16.02	136.335	21.35	0.086	1.0
6	2437	17.06	16.52	16.10	136.429	21.35	0.086	1.0
11	2462	17.10	16.58	16.06	137.149	21.37	0.086	1.0

#### 802.11g OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/cm <sup>2</sup> )
		CHAIN 0	CHAIN 1	CHAIN 2				
1	2412	25.08	24.02	24.06	829.138	29.19	0.522	1.0
6	2437	25.09	24.11	24.08	836.340	29.22	0.526	1.0
11	2462	25.03	24.06	24.07	828.373	29.18	0.521	1.0



### DRAFT 802.11n (20MHz) OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/cm <sup>2</sup> )
		CHAIN 0	CHAIN 1	CHAIN 2				
1	2412	24.52	22.56	21.02	589.915	27.71	0.371	1.0
6	2437	24.08	22.59	21.08	565.643	27.53	0.356	1.0
11	2462	23.01	22.07	21.04	488.108	26.89	0.307	1.0

### DRAFT 802.11n (40MHz) OFDM MODULATION

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)			TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/cm <sup>2</sup> )
		CHAIN 0	CHAIN 1	CHAIN 2				
1	2422	24.55	21.52	20.56	540.770	27.33	0.340	1.0
4	2437	23.08	21.05	20.02	431.048	26.35	0.271	1.0
7	2452	23.56	21.06	20.53	467.610	26.70	0.294	1.0