



# RF EXPOSURE REPORT

**REPORT NO.:** SA980511L14

**MODEL NO.:** EOC-5610, OBA-6510, FW-A8311,  
ALL0258

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

**APPLICANT:** Senao Networks Inc.

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**ISSUED BY:** Bureau Veritas Consumer Products Services  
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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  $mW/cm^2$

$P_{out}$  = 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

This device is fixed inside the host equipment. Warning statement to the user for keeping at least 25cm 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 are 6dBi or 3.981 (numeric) (for 2.4GHz); 13dBi or 19.953 (numeric) (for 5.0GHz).

### 6.2 OUTPUT POWER INTO ANTENNA & RF EXPOSURE VALUE AT DISTANCE 25cm:

**FOR 2.412 ~ 2.462GHz BAND:**

**802.11b DSSS MODULATION:**

**Test mode A**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/CM <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/CM <sup>2</sup> )
1	2412	142.233	21.53	0.072	1.000
6	2437	180.717	22.57	0.092	1.000
11	2462	178.238	22.51	0.090	1.000

**Test mode B**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/CM <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/CM <sup>2</sup> )
1	2412	142.233	21.53	0.029	1.000
6	2437	180.717	22.57	0.036	1.000
11	2462	178.238	22.51	0.036	1.000



### 802.11g OFDM MODULATION:

#### Test mode A

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/CM <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/CM <sup>2</sup> )
1	2412	284.446	24.54	0.144	1.000
6	2437	322.849	25.09	0.164	1.000
11	2462	317.687	25.02	0.161	1.000

#### Test mode B

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/CM <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/CM <sup>2</sup> )
1	2412	284.446	24.54	0.057	1.000
6	2437	322.849	25.09	0.065	1.000
11	2462	317.687	25.02	0.064	1.000



**FOR 5.180 ~ 5.240GHz, 5.745 ~ 5.825GHz BAND:**

**802.11a OFDM MODULATION:**

**Test mode A**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/CM <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/CM <sup>2</sup> )
36	5180	9.795	9.91	0.025	1.000
40	5200	9.886	9.95	0.025	1.000
48	5240	9.840	9.93	0.025	1.000
149	5745	322.107	25.08	0.818	1.000
157	5785	204.644	23.11	0.520	1.000
165	5825	225.944	23.54	0.574	1.000

**Test mode B**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	POWER DENSITY (mW/CM <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/CM <sup>2</sup> )
36	5180	9.795	9.91	0.002	1.000
40	5200	9.886	9.95	0.002	1.000
48	5240	9.840	9.93	0.002	1.000
149	5745	322.107	25.08	0.065	1.000
157	5785	204.644	23.11	0.041	1.000
165	5825	225.944	23.54	0.046	1.000