



# RF EXPOSURE REPORT

**REPORT NO.:** SA960508L13

**MODEL NO.:** SMCWEB-N

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

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## 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	6
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 20cm.

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 the product, under normal use condition, is at least 20cm away from the body of the user. Warning statement for keeping 20cm-separation distance and the prohibition of operating next to a person has been printed on the user's manual. So, this product is classified as the **Mobile Device**.



## 6 Test Results

### 6.1 Antenna Gain

The Gain measured in Fully Anechoic Chamber are 4dBi or 2.51189 (numeric).

### 6.2 Output Power Into Antenna & RF Exposure value at distance 20cm:

#### For 802.11b DSSS MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	TOTAL OUTPUT POWER TO ANTENNA (mW)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT OF POWER DENSITY (mW/cm <sup>2</sup> )
1	2412	60.534	0.030	1.0
6	2437	66.222	0.033	1.0
11	2462	59.566	0.030	1.0

#### For 802.11g OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM2))	LIMIT OF POWER DENSITY (mW/CM2)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2412	36.983	38.194	15.68	15.82	75.177	18.76	0.038	1.0
6	2437	41.210	39.084	16.15	15.92	80.294	19.05	0.040	1.0
11	2462	39.084	41.020	15.92	16.13	80.104	19.04	0.040	1.0

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

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM2))	LIMIT OF POWER DENSITY (mW/CM2)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2412	34.277	38.459	15.35	15.85	72.736	18.62	0.036	1.0
6	2437	39.355	41.783	15.95	16.21	81.138	19.09	0.041	1.0
11	2462	37.411	39.084	15.73	15.92	76.495	18.84	0.038	1.0



**DRAFT 802.11n (40MHz) OFDM MODULATION:**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)		PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	POWER DENSITY (mW/CM2)	LIMIT OF POWER DENSITY (mW/CM2)
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2422	23.174	23.714	13.65	13.75	46.888	16.71	0.023	1.0
4	2437	23.388	24.099	13.69	13.82	47.487	16.77	0.024	1.0
7	2452	23.768	24.774	13.76	13.94	48.543	16.86	0.024	1.0