



RF EXPOSURE REPORT

REPORT NO.: SA950525L06

MODEL NO.: BW1250

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 ²)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
300-1500	F/300	6
1500-100,000	5	6
(B)Limits For General Population / Uncontrolled Exposure				
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

π = 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 are 6dBi or 3.981 (numeric) (for 2.4GHz band), 8dBi or 6.310 (numeric) (for 5.0GHz band)

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

802.11b DSSS MODULATION

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	44.668	0.035	1.0
4	2427	56.624	0.045	1.0
6	2437	57.280	0.045	1.0
9	2452	58.210	0.046	1.0
11	2462	56.364	0.045	1.0

802.11g OFDM MODULATION

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	35.892	0.028	1.0
4	2427	113.763	0.090	1.0
6	2437	112.460	0.089	1.0
9	2452	111.686	0.088	1.0
11	2462	36.058	0.029	1.0

802.11a OFDM MODULATION (PER STANDARD 15.247)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5745	63.973	0.080	1.0
3	5785	79.799	0.100	1.0
4	5805	63.533	0.080	1.0

802.11a OFDM MODULATION (PER STANDARD 15.407)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5180	15.959	0.020	1.0
2	5200	28.510	0.036	1.0
4	5240	30.200	0.038	1.0

CONCLUSION:

Both of the 2.4GHz and 5GHz can transmit simultaneously. Two radios are under firmware controlled not to use the same channel or a channel which are separated less than 4 channels and is not user changeable.



The formula of calculated the MPE is:

$$CPD_1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the calculation of this situation is:

802.11b & 802.11b: $0.045 / 1 + 0.046 / 1 = 0.091$, which is less than the "1" limit.

802.11b & 802.11g: $0.046 / 1 + 0.090 / 1 = 0.136$, which is less than the "1" limit.

802.11g & 802.11g: $0.090 / 1 + 0.089 / 1 = 0.179$, which is less than the "1" limit.

802.11g & 802.11a: $0.090 / 1 + 0.100 / 1 = 0.190$, which is less than the "1" limit.