

RF EXPOSURE REPORT

REPORT NO.: SA950525H10A

MODEL NO.: WMP-G11

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

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RF Exposure Measurement

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

$\pi = 3.1416$

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, $1 mW/cm^2$. 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 client enabled the EUT to transmit and receive data at specific channel frequencies 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

There are seven antennas provided to this EUT, please refer to the following table:

No.	Antenna Type	Gain (dBi)	Connector Type	Antenna gain include cable loss
1	$\lambda/4$ Dipole	2.25 dBi	SMA Reverse	No
2	$\lambda/4$ Dipole	2.24 dBi	I-PEX	Yes
3	$1/4\lambda$ Dipole Sleeve	2.1 dBi	RP-SMA (M)	No
4	$1/4\lambda$ Dipole Sleeve	2.1 dBi	RP-SMA (M)	No
5	$1/4\lambda$ Dipole Sleeve	2.1 dBi	RP-SMA (M)	No
6	PCB	1.14 dBi	I-PEX	Yes
7	$1/4\lambda$ Dipole Sleeve	2.1 dBi	SMA Reverse	No
I Antenna 1,3,4,5 could choose antenna cable 1,2,3; Antenna 7 could choose antenna cable 4,5 (Please refer to following antenna cable table) ° I From above antennas, antenna 2 and 6 were chosen for final test.				

There are five antenna cables provided to above antennas:

No.	Brand Name	Model No.	Cable length (cm)	Cable loss (dBi)
1	WAN SHIH	SOW1294A1	11.66	0.71
2	KIN SUN	6603070205-105	10.5	0.5
3	WAN SHIH	SOW1916A1	11.9	0.57
4	WAN SHIH	THW1572A1	9	0.52
5	WAN SHIH	SAW0085A2	16	0.69

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

For Part 802.11b: (Antenna 2)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	63.096	0.021	1.0
6	2437	66.069	0.022	1.0
11	2462	61.660	0.021	1.0

For Part 802.11b: (Antenna 6)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	63.096	0.016	1.0
6	2437	66.069	0.017	1.0
11	2462	61.660	0.016	1.0

For Part 802.11g: (Antenna 2)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	47.863	0.016	1.0
6	2437	51.286	0.017	1.0
11	2462	48.978	0.016	1.0

For Part 802.11g: (Antenna 6)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	47.863	0.012	1.0
6	2437	51.286	0.013	1.0
11	2462	48.978	0.013	1.0