RF EXPOSURE REPORT

REPORT NO.: SA950210L12
MODEL NO.: WAG302v2

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: NETGEAR, Inc.

ADDRESS: 4500 Great America Parkway, Santa Clara, CA 95054, U.S.

ISSUED BY: Advance Data Technology Corporation

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang 244, Taipei Hsien, 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^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 : Pd = (Pout*G) / (4*pi*r^2)

where
Pd = power density in mW/cm^2
Pout = 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 4.59352dBi or 2.880(numeric) for 2.4GHz and 5.39536dBi or 3.463(numeric) for 5GHz

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

Antenna 1: (-4.64dBi gain)

For 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	50.466	0.003	1.0
6	2437	50.466	0.003	1.0
11	2462	50.350	0.003	1.0

For 802.11g OFDM Modulation_Normal Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	50.699	0.003	1.0
6	2437	50.234	0.003	1.0
11	2462	50.350	0.003	1.0

For 802.11g OFDM Modulation_Turbo Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
6	2437	50.699	0.003	1.0

Antenna 2: (-1.69dBi gain)

For 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	50.466	0.007	1.0
6	2437	50.466	0.007	1.0
11	2462	50.350	0.007	1.0

For 802.11g OFDM Modulation_Normal Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	50.699	0.007	1.0
6	2437	50.234	0.007	1.0
11	2462	50.350	0.007	1.0

For 802.11g OFDM Modulation_Turbo Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
6	2437	50.699	0.007	1.0

Antenna 3: (4.59352dBi gain)

For 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	50.466	0.029	1.0
6	2437	50.466	0.029	1.0
11	2462	50.350	0.029	1.0

For 802.11g OFDM Modulation_Normal Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	50.699	0.029	1.0
6	2437	50.234	0.029	1.0
11	2462	50.350	0.029	1.0

For 802.11g OFDM Modulation_Turbo Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
6	2437	50.699	0.029	1.0

For 802.11a modulation_Normal Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5180	17.824	0.012	1.0
4	5240	18.030	0.012	1.0
5	5260	17.824	0.012	1.0
8	5320	22.387	0.015	1.0
9	5745	51.168	0.035	1.0
11	5785	50.466	0.035	1.0
13	5825	50.582	0.035	1.0

For 802.11a modulation_Turbo Mode

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5210	28.510	0.020	1.0
2	5250	28.642	0.020	1.0
3	5290	28.314	0.020	1.0
4	5760	50.350	0.035	1.0
5	5800	50.699	0.035	1.0

CONCULSION:

Both of the 2.4GHz and 5GHz bands can transmit simultaneously, the formula of calculated the MPE is:

$$CPD_1 / LPD_1 + CPD_2 / LPD_2 + \ldots\ldots etc. < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the calculation of this situation is 0.029 / 1 + 0.035 / 1 = 0.064, which is less than the “1” limit.