RF EXPOSURE REPORT

REPORT NO.: SA960507H01

MODEL NO.: IP250

FCC ID: HEDIP250

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Accton Technology Corporation

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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 : $Pd = (Pout*G) / (4*pi*r^2)$

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

Pd 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 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

For 2.4GHz						
No.	Model No.	Gain (dBi)	Cable lose (dB)	Net Gain (dBi)	Antenna Type	Connector
1	MHA2400PT	4	0	4	Bi-Directional	BNC,male
2	MP24013XFPT	13	0	13	Directional Panel	N, female
3	*MMO24580608	6	1	5	Omni Directional	N, female
4	*FDS_2FED01+I3G * FDS_2FED02+I3G	2	0	2	Dipole	UFL
For 5GHz						
No.	Model No.	Gain (dBi)	Cable lose (dB)	Net Gain (dBi)	Antenna Type	Connector
A	*MMO24580608	8	2	6	Omni Directional	N, female
B	*FDS_2FED01+I3G * FDS_2FED02+I3G	4.5	0	4.5	Dipole	UFL

Note:

1. "*" is a Dual Band antenna can be used in both 2.4GHz and 5GHz.
2. The model : FDS_2FED01+I3G and FDS_2FED02+I3G is one set antenna

6.2 Output Power Into Antenna & RF Exposure value:

For 2.4GHz

802.11b:

Antenna 1

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	53.088	0.027	1.0
6	2437	74.989	0.037	1.0
11	2462	70.795	0.035	1.0

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	53.088	0.211	1.0
6	2437	74.989	0.298	1.0
11	2462	39.355	0.156	1.0

Antenna 3

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	84.140	0.053	1.0
6	2437	114.815	0.072	1.0
11	2462	112.202	0.071	1.0

Antenna 4

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	229.087	0.072	1.0
6	2437	223.872	0.071	1.0
11	2462	138.676	0.044	1.0

802.11g:

Antenna 1

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	87.096	0.044	1.0
6	2437	251.189	0.126	1.0
11	2462	46.774	0.023	1.0

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	36.308	0.144	1.0
6	2437	149.624	0.594	1.0
11	2462	14.454	0.057	1.0

Antenna 3

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	87.096	0.055	1.0
6	2437	251.189	0.158	1.0
11	2462	52.481	0.033	1.0

Antenna 4

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	128.825	0.041	1.0
6	2437	281.838	0.089	1.0
11	2462	58.614	0.018	1.0

For 5GHz

Operated in 5150MHz ~ 5250MHz: (15.407)

Antenna A

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5180	11.376	0.009	1.0
4	5240	24.378	0.019	1.0
Turbo 1	5210	13.868	0.011	1.0

Antenna B

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5180	14.588	0.008	1.0
4	5240	30.974	0.017	1.0
Turbo 1	5210	18.793	0.011	1.0

Operated in 5725 ~ 5850MHz band: (15.247)

Antenna A

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5745	208.930	0.166	1.0
3	5785	234.423	0.186	1.0
5	5825	245.471	0.194	1.0
Turbo 1	5760	223.872	0.177	1.0
Turbo 2	5800	199.526	0.158	1.0

Antenna B

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5745	288.403	0.162	1.0
3	5785	309.030	0.173	1.0
5	5825	331.131	0.186	1.0
Turbo 1	5760	309.030	0.173	1.0
Turbo 2	5800	295.121	0.165	1.0

CONCULSION:

Both of the 11g and 11a can transmit simultaneously, the formula of calculated the MPE is:

$CPD_1 / LPD_1 + CPD_2 / LPD_2$ + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Therefore, the calculation of this situation is 0.594 / 1 + 0.194 / 1 = 0.788, which is less than the “1” limit.