RF EXPOSURE REPORT

REPORT NO.: SA980602H02

MODEL NO.: MAX-207HW2

ACCORDING: FCC Guidelines for Human Exposure

IEEE C95.1

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ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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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 our lab, 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 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

For WLAN

The maximum Gain is PIFA antenna: 1.60126dBi or 1.44586 (numeric)

For WiMAX

The maximum Gain measured in Fully Anechoic Chamber is 6.22153dBi or 4.18941 (numeric)

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

For WLAN
Part 802.11b:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm2)	Limit of Power Density (mW/cm^2)
1	2412	106.905	0.031	1.0
6	2437	144.212	0.041	1.0
11	2462	104.713	0.030	1.0

Part 802.11g:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	264.241	0.076	1.0
6	2437	274.157	0.079	1.0
11	2462	257.040	0.074	1.0

For WiMAX
CHANNEL BANDWIDTH: 5MHz

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
Low	2505	425.598	0.355	1.0
Middle	2590	400.867	0.334	1.0
High	2685	419.759	0.350	1.0

CHANNEL BANDWIDTH: 10MHz

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
Low	2505	432.514	0.360	1.0
Middle	2590	433.511	0.361	1.0
High	2685	413.048	0.344	1.0

CONCULSION:

Both of the WLAN and WiMAX 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 worst-case situation is 0.079 / 1 + 0.361 / 1 = 0.44, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.