RF EXPOSURE REPORT

REPORT NO.: SA960524H05

MODEL NO.: U98H038

FCC ID: MCLU98H038

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Hon Hai PRECISION IND.CO.,LTD

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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

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

Transmitter Circuit	Antenna Type	Antenna Connector	Gain(dBi)		
			2412~2462 (MHz)	5150~5250 (MHz)	5725~5850 (MHz)
Chain(0)	Printed	Reverse SMA	1.5	0.5	-0.86
Chain(1)			-2.5	-11.4	-7.31
Chain(2)			1.28	1.09	-0.43

6.2 Output Power Into Antenna & RF Exposure value:

For 2.4GHz

For Part 802.11b:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	64.269	0.018	1.0
6	2437	80.910	0.023	1.0
11	2462	65.464	0.018	1.0

For 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	54.200	0.015	1.0
6	2437	128.825	0.036	1.0
11	2462	70.795	0.020	1.0

DRAFT 802.11n (20MHz) 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	64.421	0.018	1.0
6	2437	176.208	0.050	1.0
11	2462	86.050	0.024	1.0

DRAFT 802.11n (40MHz) OFDM modulation:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2422	27.565	0.008	1.0
4	2437	53.827	0.015	1.0
7	2452	33.943	0.010	1.0

For 5GHz

Operated in 5150MHz ~ 5350MHz: (15.407)

For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5180	7.046	0.0018	1.0
4	5240	23.281	0.0060	1.0

DRAFT 802.11n (20MHz) OFDM modulation:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5180	18.719	0.005	1.0
4	5240	27.673	0.007	1.0

DRAFT 802.11n (40MHz) OFDM modulation:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5190	17.696	0.005	1.0
3	5230	49.908	0.013	1.0

Operated in 5725 ~ 5850MHz band: (15.247)
For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5745	100.00	0.0181	1.0
3	5785	100.00	0.0180	1.0
5	5825	75.858	0.0137	1.0

DRAFT 802.11n (20MHz) OFDM modulation:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5745	164.120	0.033	1.0
3	5785	164.120	0.033	1.0
5	5825	155.908	0.031	1.0

DRAFT 802.11n (40MHz) OFDM modulation:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	5755	193.223	0.038	1.0
3	5795	155.677	0.031	1.0