RF EXPOSURE REPORT

REPORT NO.: SA990621E09

MODEL NO.: RT5390

FCC ID: VQF-RT5390

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Ralink Technology Corporation

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

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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	30
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. So, this device is classified as **Mobile Device**.

6. TEST RESULTS

6.1 Antenna Gain

There are two sets of antennas provided to this EUT, please refer to the following table:

Set 1						
Chain	Manufacture	Model name	Antenna Gain (dBi)	Antenna Cable Length	Antenna Type	Connector
Chain (0)	JOYMAX	IWX-145XRSXX-999	3.7	200 mm	Dipole	IPEX
Chain (1)	JOYMAX	IWX-145XRSXX-999	3.7	200 mm	Dipole	IPEX
Set 2						
Chain	Manufacture	Model name	Antenna Gain (dBi)	Antenna Cable Length	Antenna Type	Connector
Chain (0)	ACON	APP6P-700119	3.5	225 mm	PIFA	IPEX
Chain (1)	ACON	APP6P-700119	3.5	225 mm	PIFA	IPEX

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

For Dipole Antenna:

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	91.2	0.043	1.0
6	2437	83.2	0.039	1.0
11	2462	77.6	0.036	1.0

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	239.9	0.112	1.0
6	2437	234.4	0.109	1.0
11	2462	173.8	0.081	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	213.8	0.100	1.0
6	2437	208.9	0.097	1.0
11	2462	158.5	0.074	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2422	138.0	0.064	1.0
4	2437	218.8	0.102	1.0
7	2452	169.8	0.079	1.0

For PIFA Antenna:

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	91.2	0.041	1.0
6	2437	83.2	0.037	1.0
11	2462	77.6	0.035	1.0

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	239.9	0.107	1.0
6	2437	234.4	0.104	1.0
11	2462	173.8	0.077	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	213.8	0.095	1.0
6	2437	208.9	0.093	1.0
11	2462	158.5	0.071	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2422	138.0	0.061	1.0
4	2437	218.8	0.097	1.0
7	2452	169.8	0.076	1.0

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