RF EXPOSURE REPORT

REPORT NO.: SA930909L11A
MODEL NO.: WMCE54AG2

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Cisco-Linksys, LLC

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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 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

This device is not fixed inside the host equipment, it is connected with host through wire. So it is easy to be re-located in the place where at least 20cm far 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 are 4.0dBi or 2.511 (numeric) for 2.4GHz, 5.0dBi or 3.162 (numeric) for 5.0GHz.

6.2 Output Power Into Antenna & RF Exposure Distance:

For 2.4GHz Band:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	39.811	0.0199	1.0
6	2437	40.738	0.0204	1.0
11	2462	41.687	0.0208	1.0

For 5.0GHz Band:
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	16.069	0.010	1.0
4	5240	16.144	0.010	1.0
5	5260	15.885	0.010	1.0
8	5320	9.016	0.006	1.0
9	5745	15.959	0.010	1.0
12	5805	16.144	0.010	1.0

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	15.922	0.010	1.0
2	5250	15.849	0.010	1.0
3	5290	15.922	0.010	1.0
4	5760	16.069	0.010	1.0
5	5800	15.922	0.010	1.0

Note: Both of the 2.4GHz and 5GHz bands can transmit simultaneously, the maximum power density value is 0.0308 mW/cm^2, which is less than the 1mW/cm^2 limit.