RF EXPOSURE REPORT

REPORT NO.: SA940301L04B

MODEL NO.: CB3000

ACCORDING: FCC Guidelines for Human Exposure

IEEE C95.1

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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

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

The maximum Gain measured in Fully Anechoic Chamber is 13.9dBi or 24.54709 (numeric) (for 2.4GHz), 13dBi or 19.9526(numeric) (for 5GHz).

6.2 Output Power Into Antenna & RF Exposure Distance:

FOR STANDARD 15.247
802.11b DSSS MODULATION
FOR ANTENNA ITEM 1 (3.5dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	82.604	0.037	1.0
6	2437	82.224	0.037	1.0
11	2462	83.560	0.037	1.0

FOR ANTENNA ITEM 2 (3.3dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	84.333	0.036	1.0
6	2437	82.604	0.035	1.0
11	2462	83.560	0.036	1.0

FOR ANTENNA ITEM 5 (13.9dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	18.072	0.088	1.0
6	2437	14.388	0.070	1.0
11	2462	11.376	0.056	1.0

802.11g OFDM MODULATION
FOR ANTENNA ITEM 1 (3.5dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	53.456	0.024	1.0
6	2437	93.756	0.042	1.0
11	2462	47.098	0.021	1.0

FOR ANTENNA ITEM 2 (3.3dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit of Power Density (mW/cm²)
1	2412	52.481	0.022	1.0
6	2437	91.201	0.039	1.0
11	2462	46.132	0.020	1.0

FOR ANTENNA ITEM 5 (13.9dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit of Power Density (mW/cm²)
1	2412	25.410	0.124	1.0
6	2437	25.527	0.125	1.0
11	2462	25.235	0.123	1.0

802.11a OFDM MODULATION
FOR ANTENNA ITEM 3 (5.0dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit of Power Density (mW/cm²)
1	5745	82.035	0.052	1.0
3	5785	82.224	0.052	1.0
5	5825	82.224	0.052	1.0

FOR ANTENNA ITEM 4 (13.0dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit of Power Density (mW/cm²)
1	5745	82.604	0.328	1.0
3	5785	82.794	0.329	1.0
5	5825	82.794	0.329	1.0

FOR STANDARD 15.407
802.11a OFDM MODULATION
FOR ANTENNA ITEM 3 (5.0dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit of Power Density (mW/cm²)
1	5180	8.913	0.006	1.0
4	5240	8.995	0.006	1.0
5	5260	19.770	0.012	1.0
8	5320	21.478	0.014	1.0
9	5745	9.226	0.006	1.0
11	5785	39.902	0.025	1.0
12	5805	11.749	0.061	1.0

FOR ANTENNA ITEM 4 (13.0dBi gain)

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit of Power Density (mW/cm²)
1	5180	5.047	0.020	1.0
4	5240	5.546	0.022	1.0
5	5260	5.105	0.020	1.0
8	5320	5.105	0.020	1.0
9	5745	5.082	0.020	1.0
11	5785	44.978	0.179	1.0
12	5805	5.070	0.023	1.0