

FCC TEST REPORT

REPORT NO.: RF910909R01

MODEL NO.: DI-754

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

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ILAC MRA



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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 : $P_d = (P_{out} * G) / (4 * \pi * r^2)$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

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 Climate Condition

The temperature and related humidity: 20 deg. C and 63 % RH

6. 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 20 cm 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**.

7 Test Results

7.1 Antenna Gain

The maximum Gain measured for 5GHz band in Fully Anechoic Chamber is 2dBi or 1.58(numeric).

7.2 Output Power Into Antenna & RF Exposure Distance :

For 5GHz Band:

CHANNEL	CHANNEL FREQUENCY (MHz)	OUTPUT POWER TO ANTENNA (mW)	MINIMUM ALLOWABLE DISTANCE (r) FROM SKIN (Centi-Meter)
1	5180	35.08	2.10
4	5240	34.43	2.08
5	5260	77.98	3.14
8	5320	71.12	2.99

For 2.4GHz Band:

CHANNEL	CHANNEL FREQUENCY (MHz)	OUTPUT POWER TO ANTENNA (mW)	MINIMUM ALLOWABLE DISTANCE (r) FROM SKIN (Centi-Meter)
1	2412	76.38	2.77
6	2437	65.01	2.55
11	2462	74.30	2.73

The minimum allowable distance ($3.14+2.77=5.91$) is very close to the enclosure of the antenna. So, the user has no need to worry about the harmfulness of radiation. But it is recommended to always keep, at least, 20 cm separation distance with the antenna.