RF Exposure Measurement

1. Introduction
The maximum Gain measured in Fully Anechoic Chamber
Because this deivce is transmitting the high power signal, it is regarded specially as a dangerous band for its heating harmfulness to the human body. The manufacturer whose product is working in this frequency band is obligatory to prove the harmfulness of his product.

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), and 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.

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) – **Class A**

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Average Time (minutes)
0.3 – 3.0	614	1.63	*(100)	6
3.0 – 30	1842/f	4.89/f	*(900/f^2)	6
30 – 300	61.4	0.163	1.0	6
300 – 1500			F/300	6
1500 – 100,000			5	6

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) – **Class B**

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Average Time (minutes)
0.3 – 1.34	614	1.63	*(100)	30
1.34 – 30	824/f	2.19/f	*(180/f^2)	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	–	–	F/1500	30
1500 – 100,000	–	–	1.0	30

F = Frequency in MHz   * = Plane-wave equivalent power density

3. Friis Formula

$$R = \sqrt{\frac{PG}{4\pi S}}$$

The maximum Gain measured in Fully Anechoic Chamber

LTE : 50.118 (nemeric)

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

MODE: LTE

4. Test Results

The maximum Gain measured in Fully Anechoic Chamber

Band	dBi	nemeric
728.00MHz ~ 746.00 MHz /698.00MHz ~ 716.00 MHz	17 dBi	50.118 (nemeric)

4.2 Output Power into Antenna & Power Density (0.5mW/cm2) :

MODE: LTE

Band	Channel Frequency (MHz)	MAX Output Power to Antenna (mW)	Power Density (mW/cm2)
728.00MHz ~ 746.00 MHz	737.00 MHz	19588.45	195.3

The Maximum antenna gain is 17dBi and the shortest distance from the human specific is 398.75 cm, the device is compliant with the requirement MPE limit for uncontrolled exposure.