

# www.tuv.com Appendix 10

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# **RF Exposure Report**

### **RF Exposure Measurement**

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The gain of the antennas used in the product is extracted from the Antenna data sheets provided 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 far field assumption, the calculated result of that is an overprediction for near field power density. It is taken as worst case to specify the safety range.

### **RF Exposure Limit**

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range	Electric Field	Magnetic Field	Power Density					
(MHz)	Strength (V/m)	Strength (A/m)	(mW/cm²)					
Limits for Occupational / controlled Exposures								
300 - 1500			F/300					
1500 – 100000			5.0					
Limits for General population / Uncontrolled Exposure								
300 - 1500		F/1500						
1500 – 100000	1500 – 100000		1.0					

F= Frequency in MHz



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#### **Friss Formula**

Friss Transmission Formula:  $Pd = (Pout * G) / (4*pi*r^2)$ 

Where

Pd = power density in mW/cm<sup>2</sup>

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

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

If we know the maximum gain of the antenna and the total output power to the antenna, through calculation, we will know MPE value at distance 20cm.

### **EUT Operation condition**

EUT was enabled to transmit and receive at lowest, middle and highest channels.

#### 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 from the antenna should be included in the User manual. So, this device is classified as Mobile device.

### **Test Results**

Gain(G) = 0.5dBi

Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm²)	Limit (mW/cm²)
802.11 b	1	2442	55.08	0.005482	1.000
802.11 g	54	2442	59.42	0.005915	1.000
802.11 n	65	2442	60.25	0.005997	1.000
Zigbee	0.250	2405	34.83	0.003467	1.000
Bluetooth Classic	2	2440	51.88	0.005163	1.000
Bluetooth LE	1	2442	29.04	0.00289	1.000
802.11a	24	5180	9.88	0.000984	1.000
802.11n	6.5	5180	10.25	0.001021	1.000