1. FCC 47CFR §2.1091 REQUIREMENT-KDB 447498 D01v06

1.1 TEST STANDARDS

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 over-prediction for near field power density. It is taken as worst case to specify the safety range.

1.2 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 (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (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	--	--	1.0

F= Frequency in MHz

Friss Formula

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

Where

Pd = power density in mW/cm²

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.

1.3 TEST RESULT

Turn up

BLE	
	Peak (dBm)
BLE	4.5
WIFI	
MODE	Maximum Average Power (dBm)
802 11b	20.50
802.11g	20.00
802.11n-HT20	19.00
802.11n-HT40	18.50

Protocol	Max Turn up Power (dBm)	Max Turn up Power (mW)	ANT Gain (numeric scale)	Power Density (mW/cm²)	Limit (mW/cm²)	Result
BLE						
Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S)(mW/cm2)	Test Result
2440	2.118	4.5	2.818	0.00119	1	Pass
WIFI						
Frequency (MHz)	Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S)(mW/cm2)	Test Result
2412	2.118	20.5	112.202	0.04728	1	Pass
2437	2.118	20.5	112.202	0.04728	1	Pass
2462	2.118	20.5	112.202	0.04728	1	Pass

The max MPE of BLE & WIFI simultaneous transmission:

0.00119(BLE) + 0.04728 = 0.04847 $<$ 1

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