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 over-prediction 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)

F= Frequency in MHz

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)
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

Friss Formula

Friss Transmission Formula: Pd = (Pout * G) / (4*pi*r²)

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.

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)
2.4G:
ANT-A=4.888 dBi
ANT-B=4.638 dBi
ANT-C=4.158 dBi
Total gain=9.3378≈9.3

5G:
ANT-A=5.924 dBi
ANT-B=4.425 dBi
ANT-C=6.431 dBi
Total gain=10.4055≈10.4

tune up power

2.4G

Mode	WIFI
IEEE 802.11b	18.0±1dBm
IEEE 802.11g	17.0±1dBm
IEEE 802.11n HT20	17.5±1dBm
IEEE 802.11n HT40	14.0±1dBm

5G

Protocol	Channel Frequency (MHz)	tune up power		
		A	B	C
802.11a	5200	7±1dBm	7±1dBm	7±1dBm
802.11n	5200	5.5±1dBm	5.5±1dBm	5.5±1dBm
802.11a	5785	11±1dBm	11±1dBm	11±1dBm
802.11n	5785	6±1dBm	6±1dBm	6±1dBm

Protocol	Channel Frequency (MHz)	Output Power to Antenna (mW)			Power Density (mW/cm²)				Limit (mW/cm²)
		A	B	C	A	B	C	total	
802.11 b	2437	79.43	79.43	79.43	0.0487	0.0460	0.0412	0.2359	1.000
802.11 g	2437	63.10	63.10	63.10	0.0387	0.0365	0.0327	0.1079	1.000
802.11 n	2437	70.79	70.79	70.79	0.0434	0.0410	0.0367	0.1211	1.000
802.11a	5200	6.310	6.310	6.310	0.0049	0.0035	0.0055	0.0139	1.000
802.11n	5200	4.467	4.467	4.467	0.0035	0.0025	0.0039	0.0099	1.000
802.11a	5785	15.85	15.85	15.85	0.0123	0.0087	0.0139	0.0349	1.000
802.11n	5785	5.012	5.012	5.012	0.0039	0.0028	0.0044	0.0111	1.000