

# RF Exposure Report

**FCC ID: 2AVWBAX1800**

## 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)

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

Limits for Maximum Permissible Exposure (MPE)

F= Frequency in MHz

## Friss Formula

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

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = 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.

### 2.4G WIFI

Mode	802.11b/g/n20: 2412-2462MHz 802.11n40: 2422-2452MHz
Detector	PEAK
802.11b	16±1dBm
802.11g	18±1dBm
802.11n20	21±1dBm
802.11ac20	21±1dBm
802.11ax20	21±1dBm
802.11n40	20±1dBm
802.11ac40	20±1dBm
802.11ax40	20.5±1dBm

### ANT Gain (G)

Antenna number: 2\*Dipole

Antenna A gain : 4.2dBi

Antenna B gain : 4.2dBi

MIMO technology Directional gain= 7.21dBi

(gain of antenna in linear scale=5.26)

Protocol	ANT Gain(gain of antenna in linear scale)	Channel Frequency (MHz)	Output Power to Antenna (dBm)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
802.11 b	5.26	2462	17	50.1187	0.05247	1
802.11 g	5.26	2462	19	79.4328	0.08316	1
802.11 n20	5.26	2412	22	158.4893	0.16593	1
802.11 n40	5.26	2422	21	125.8925	0.13181	1
802.11 ac20	5.26	2412	22	158.4893	0.16593	1
802.11 ac40	5.26	2452	21	125.8925	0.13181	1
802.11 ax20	5.26	2437	22	158.4893	0.16593	1
802.11 ax40	5.26	2452	21.5	141.2538	0.14789	1

### 5G WIFI

#### ANT Gain (G)

Mode	IEEE 802.11a/ n/ac(HT20) /ax(HT20) 5.180GHz-5.240GHz IEEE 802.11n/ac(HT40) /ax(HT40) 5.190GHz-5.310GHz IEEE 802.11ac(HT80) /ax(HT80) 5.210GHz
Detector	PEAK
802.11 a	8±1dBm
802.11 n/ac(HT20) /ax(HT20)	10±1dBm
802.11 n(HT40)	13±1dBm
802.11 ac(HT40) /ax(HT40)	11±1dBm
802.11 ac(HT80)	10±1dBm
802.11 ax(HT80)	8.5±1dBm

Antenna number: 2\*Dipole

Antenna A gain : 4.5dBi

Antenna B gain : 4.5dBi

MIMO technology Directional gain= 7.51dBi

(gain of antenna in linear scale=5.636)

Protocol	ANT Gain(gain of antenna in linear scale)	Channel Frequency (MHz)	Output Power to Antenna (dBm)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
802.11 a	5.636	5180	9	7.9433	0.09999	1
802.11 n/ac(HT20)/ax(HT20)	5.636	5180	11	12.5893	0.09999	1
802.11 n(HT40)	5.636	5180	14	25.1189	0.02818	1
802.11 ac(HT40)/ax(HT40)	5.636	5230	12	15.8489	0.09999	1
802.11 ac(HT80)	5.636	5210	11	12.5893	0.09999	1
802.11 ax(HT80)	5.636	5210	9.5	8.9125	0.09999	1

**5G WIFI****ANT Gain (G)**

Mode	IEEE 802.11a/ n/ac(HT20) /ax(HT20): 5.745GHz-5.825GHz IEEE 802.11a/ n/ac(HT40) /ax(HT40): 5.755GHz-5.795GHz IEEE 802.11ac(HT80) /ax(HT80): 5.775GHz
Detector	PEAK
802.11 a/n/ac(HT20)	6±1dBm
802.11 n/ac(HT20)	9±1dBm
802.11 ax(HT20)	9.5±1dBm
802.11 n/ac(HT40)/ax(HT40)	10.5±1dBm
802.11 ac(HT80)/ax(HT80)	9.5±1dBm

**Antenna number: 2\*Dipole****Antenna A gain : 4.5dBi****Antenna B gain : 4.5dBi****MIMO technology Directional gain= 7.51dBi****(gain of antenna in linear scale=5.636)**

Protocol	ANT Gain(gain of antenna in linear scale)	Channel Frequency (MHz)	Output Power to Antenna (dBm)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
802.11 a	5.636	5825	7	5.0119	0.03162	1
802.11 n/ac(HT20)	5.636	5825	10	10.0000	0.01122	1
802.11 ax(HT20)	5.636	5825	10.5	11.2202	0.01259	1
802.11 n/ac(HT40)/ax(HT40)	5.636	5795	11.5	14.1254	0.01585	1
802.11 n/ac(HT80)/ax(HT80)	5.636	5775	10.5	11.2202	0.01259	1