

# RF Exposure Report

**FCC ID: 2AQ7Q-DB50475**

## 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.

### BT4.2+EDR

Mode	2402-2480MHz
Detector	PEAK
GFSK	1±1dBm
$\pi/4$ -DQPSK	1.5±1dBm
8DPSK	1.5±1dBm

### ANT Gain (G)

Antenna gain : 4.92dBi (gain of antenna in linear scale=3.10)

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> )
GFSK	3.1	2480	2	1.58489	0.00098	1
$\pi/4$ -DQPSK	3.1	2480	2.5	1.77828	0.00110	1
8DPSK	3.1	2480	2.5	1.77828	0.00110	1

## BT4.2

Mode	2402-2480MHz
Detector	PEAK
GFSK	2±1dBm

### ANT Gain (G)

Antenna gain : 4.92dBi (gain of antenna in linear scale=3.10)

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> )
GFSK	3.1	2480	3	1.99526	0.00123	1

## 2.4G WIFI

Mode	802.11b/g/n20:2412-2462MHz 802.11n40:2422-2452MHz
Detector	PEAK
802.11b	15±1dBm
802.11g	13±1dBm
802.11n20	13±1dBm
802.11n40	14±1dBm

### ANT Gain (G)

Antenna gain : 4.92dBi (gain of antenna in linear scale=3.10)

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> )
802.11b	3.1	2462	16	39.81072	0.02456	1
802.11g	3.1	2462	14	25.11886	0.01550	1
802.11n20	3.1	2462	14	25.11886	0.01550	1
802.11n40	3.1	2452	15	31.62278	0.01951	1

## 5.2G WIFI

Mode	802.11a/n20/n40/ac20/ac40/ac80: 5.15-5.25GHz
Detector	AV
802.11a	6±1dBm
802.11n20	6±1dBm
802.11n40	5±1dBm
802.11ac20	6±1dBm
802.11ac40	5±1dBm
802.11ac80	4±1dBm

**ANT Gain (G)****Antenna gain : 6.85dBi (gain of antenna in linear scale=4.84)**

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> )
802.11a	4.84	5240	7	5.01187	0.00483	1
802.11n20	4.84	5240	7	5.01187	0.00483	1
802.11n40	4.84	5230	6	3.98107	0.00384	1
802.11ac20	4.84	5240	7	5.01187	0.00483	1
802.11ac40	4.84	5230	6	3.98107	0.00384	1
802.11ac80	4.84	5210	5	3.16228	0.00305	1

**5.3G WIFI**

Mode	802.11a/n20/n40/ac20/ac40/ac80: 5.25-5.35GHz
Detector	AV
802.11a	4±1dBm
802.11n20	4±1dBm
802.11n40	5±1dBm
802.11ac20	4±1dBm
802.11ac40	4±1dBm
802.11ac80	4±1dBm

**ANT Gain (G)****Antenna gain : 6.85dBi (gain of antenna in linear scale=4.84)**

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> )
802.11a	4.84	5320	5	3.16228	0.00305	1
802.11n20	4.84	5320	5	3.16228	0.00305	1
802.11n40	4.84	5310	6	3.98107	0.00384	1
802.11ac20	4.84	5320	5	3.16228	0.00305	1
802.11ac40	4.84	5310	5	3.16228	0.00305	1
802.11ac80	4.84	5290	5	3.16228	0.00305	1

**5.6G WIFI**

Mode	802.11a/n20/n40/ac20/ac40/ac80: 5.47-5.725GHz
Detector	AV
802.11a	11±1dBm
802.11n20	11±1dBm
802.11n40	10±1dBm

802.11ac20	11±1dBm
802.11ac40	10±1dBm
802.11ac80	10±1dBm

### ANT Gain (G)

Antenna gain : 6.85dBi (gain of antenna in linear scale=4.84)

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> )
802.11a	4.84	5580	12	15.84893	0.01527	1
802.11n20	4.84	5580	12	15.84893	0.01527	1
802.11n40	4.84	5510	11	12.58925	0.01213	1
802.11ac20	4.84	5580	12	15.84893	0.01527	1
802.11ac40	4.84	5510	11	12.58925	0.01213	1
802.11ac80	4.84	5530	11	12.58925	0.01213	1

### 5.8G WIFI

Mode	802.11a/n20/n40/ac20/ac40/ac80: 5.745-5.825GHz
Detector	AV
802.11a	5.5±1dBm
802.11n20	5±1dBm
802.11n40	5.1±1dBm
802.11ac20	5.5±1dBm
802.11ac40	5±1dBm
802.11ac80	8±1dBm

### ANT Gain (G)

Antenna gain: 3.95dBi (gain of antenna in linear scale=2.48)

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> )
802.11a	2.48	5785	6.5	4.46684	0.00220	1
802.11n20	2.48	5745	6	3.98107	0.00197	1
802.11n40	2.48	5755	6.1	4.07380	0.00201	1
802.11ac20	2.48	5745	6.5	4.46684	0.00220	1
802.11ac40	2.48	5795	6	3.98107	0.00197	1
802.11ac80	2.48	5775	9	7.94328	0.00392	1

Note: the BT and WIFI cannot be transmit at the same time.