RF Exposure Report

FCC ID: 2AZVC-ABSL-G

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^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

Limits for Maximum Permissible Exposure (MPE)

F= Frequency in MHz

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.

BT4.1+EDR

Mode	2402-2480MHz		
Detector	AVG		
	LOW	MID	HIGH
GFSK	6±1dBm	3±1dBm	1±1dBm
π/4-DQPSK	4±1dBm	1±1dBm	-1±1dBm
8DPSK	3±1dBm	1±1dBm	-1±1dBm

ANT Gain (G)
Antenna gain : 6dBi (gain of antenna in linear scale=3.98)

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/cm²)	Limit (mW/cm²)
GFSK	3.98	2402	7	5.0119	0.00397	1
π/4-DQPSK	3.98	2402	5	3.1623	0.00251	1
8DPSK	3.98	2402	4	2.5119	0.00199	1

BT4.1 LE

Mode	2402-2480MHz
Detector	PEAK
GFSK	-8±1dBm

ANT Gain (G)

Antenna gain : 6dBi (gain of antenna in linear scale=3.98)

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/cm²)	Limit (mW/cm²)
GFSK	3.98	2402	-7	0.1995	0.00016	1

2.4G WIFI

Mode	802.11b/g/n20:2412-2462MHz 802.11n40:2422-2452MHz
Detector	AVG
802.11b	13±1dBm
802.11g	8±1dBm
802.11n20	7.5±1dBm
802.11n40	7±1dBm

ANT Gain (G)

Antenna gain : 6dBi (gain of antenna in linear scale=3.98)

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/cm²)	Limit (mW/cm²)
802.11 b	3.98	2412	14	25.1189	0.01990	1
802.11 g	3.98	2437	9	7.9433	0.00629	1
802.11 n20	3.98	2437	8.5	7.0795	0.00561	1
802.11 n40	3.98	2422	8	6.3096	0.00500	1

GSM

Mode	GSM: GSM 850: 824 MHz ~ 849 MHz
Detector	AVG
GSM 850	29.7±1dBm

ANT Gain (G)

Antenna gain : 2.8dBi (gain of antenna in linear scale=1.91)

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/cm²)	Limit (mW/cm²)
GSM 850	1.91	848.8	30.7	1174.8976	0.44667	0.565866667

WCDMA

Mode	WCDMA: Band V: 824 MHz ~ 849 MHz
Detector	AVG
Band V	21.5±1dBm

ANT Gain (G)

Antenna gain : 2.8dBi (gain of antenna in linear scale=1.91)

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/cm²)	Limit (mW/cm²)
Band V	1.91	826.4	22.5	177.8279	0.06761	0.550933333

LTE

Mode	LTE Band 5:824~849MHz LTE Band 41:2555~2655MHz
Detector	AVG
LTE Band 5	21±1dBm
LTE Band 41	23±1dBm

ANT Gain (G)

LTE Band 5 Antenna gain : 2.8dBi (gain of antenna in linear scale=1.91)

LTE Band 41 Antenna gain : 6dBi (gain of antenna in linear scale=3.98)

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/cm²)	Limit (mW/cm²)
LTE Band 5	1.91	836.5	22	158.4893	0.06025	0.557666667
LTE Band 41	3.98	2593	24	251.1886	0.09550	1

Multiple Evaluation

BT/1+ WIFI/1+GSM/0.55=(0.00397/1) + (0.01990/1) + (0.44667/0.55)=0.8360
BT/1+ WIFI/1+WCDMA/0.55=(0.00397/1) + (0.01990/1) + (0.06761/0.55)=0.1468
BT/1+ WIFI/1+LTE/0.55=(0.00397/1) + (0.01990/1) + (0.09550/1)=0.1193

According to the maximum gain of the antenna and the total output power to the antenna, through calculation, we will know max MPE value 0.8360 at distance 20cm. This is less than the limit 1, So Compliance the RF exposure requirement.