

RF Exposure Report

FCC-ID: 2A9JBT2

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)

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

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/cm²

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	13±1dBm
802.11g	13.5±1dBm
802.11n20	13.5±1dBm
802.11n40	13.5±1dBm

ANT Gain (G)

Antenna gain : 2.62dBi (gain of antenna in linear scale=1.828)

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 ²)	Limit (mW/cm ²)
802.11 b	1.828	2412	14	25.1189	0.00914	1
802.11 g	1.828	2462	14.5	28.1838	0.01025	1
802.11 n20	1.828	2462	14.5	28.1838	0.01025	1
802.11 n40	1.828	2452	14.5	28.1838	0.01025	1

GPRS/EGPRS/WCDMA

Mode	GPRS/EGPRS: Band V: 824 MHz ~ 849 MHz Band II: 1850 MHz ~ 1910 MHz WCDMA Band V: 824 MHz ~ 849 MHz
Detector	PEAK
GPRS850	32.5±1dBm
GPRS1900	29.5±1dBm
EGPRS850	29.5±1dBm
EGPRS1900	31±1dBm
WCDMA850	23±1dBm

ANT Gain (G)

GPRS/EGPRS 850 Antenna gain : -0.66dBi (gain of antenna in linear scale=0.859)

GPRS/EGPRS 1900 Antenna gain : 0.29dBi (gain of antenna in linear scale=1.069)

WCDMA 850 Antenna gain : -0.66dBi (gain of antenna in linear scale=0.859)

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 ²)	Limit (mW/cm ²)
GPRS850	0.859	846.8	33.5	2238.7211	0.38277	1
GPRS1900	1.069	1880	30.5	1122.0185	0.23874	1
EGPRS850	0.859	848.8	30.5	1122.0185	0.19184	1
EGPRS1900	1.069	1850.2	32	1584.8932	0.33723	1
WCDMA850	0.859	846.6	24	251.1886	0.04295	1

LTE

Mode	LTE Band 4:1710~1755MHz LTE Band 5:824~849MHz LTE Band 38:2570~2620MHz LTE Band 40:2305~2315MHz/2350~2360MHz LTE Band 41:2555~2655MHz
Detector	PEAK
LTE Band 4	23±1dBm
LTE Band 5	23.5±1dBm
LTE Band 38	21±1dBm
LTE Band 40 (2305~2315)	22±1dBm
LTE Band 40 (2350~2360)	22±1dBm
LTE Band 41	23±1dBm

ANT Gain (G)

Band 4 Antenna gain : 0.41dBi (gain of antenna in linear scale=1.099)

Band 5 Antenna gain : -0.66dBi (gain of antenna in linear scale=0.859)

Band 38 Antenna gain : 1.59dBi (gain of antenna in linear scale=1.442)

Band 40(2305-2315) Antenna gain : 0.73dBi (gain of antenna in linear scale=1.183)

Band 40 (2350-2360) Antenna gain : 0.28dBi (gain of antenna in linear scale=1.066)

Band 41 Antenna gain : 2.93dBi (gain of antenna in linear scale=1963)

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 ²)	Limit (mW/cm ²)
LTE Band 4	1.099	1850	24	251.1886	0.05495	1
LTE Band 5	0.859	1710	24.5	281.8383	0.06165	1
LTE Band 38	1.442	824	22	158.4893	0.04549	1
LTE Band 40	1.183	699	23	199.5262	0.04698	1
LTE Band 40	1.066	777	23	199.5262	0.04234	1
LTE Band 41	1.963	704	24	251.1886	0.09815	1