

RF Exposure Report

FCC ID: 2AA9MYH001

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

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

π = 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/n20:2412-2472MHz
Detector	AVG
max 802.11b	13±1dBm
max 802.11g	14±1dBm
max 802.11n20	14±1dBm

ANT Gain (G)

Antenna A gain : 4.8dBi

Antenna gain: 4.8dBi (gain of antenna in linear scale=3.02),

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	3.02	2412	14	25.1189	0.01510	1
802.11 g	3.02	2437	15	31.6228	0.01901	1
802.11 n20	3.02	2437	15	31.6228	0.01901	1

ZWAVE

Mode	GFSK
Detector	QP
908.4 MHz+916 MHz	92.4±1dBuV/m

93.4dBuV/m=93.4-95.3=-1.9dBm

ANT Gain (G): 1.7dBi (gain of antenna in linear scale=1.48)

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 ²)	Limit (mW/cm ²)
GFSK	1.48	908.4	-1.9	0.6457	0.00019	0.6056

NICE

Mode	GFSK/OOK
Detector	Peak
433.92 MHz	77.21±1dBuV/m

78.21dBuV/m=73.21-95.3=-17.09dBm

ANT Gain (G): -2.2dBi (gain of antenna in linear scale=0.60)

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)
GFSK/OOK	0.6	433.92	-17.09	0.0195	2.334E-06	0.28928

Multiple Evaluation

WIFI/1+ZWAVE/0.6055+NICE/0.28928=(0.01901/1) + (0.00019/0.6056) + (2.334E-06/0.28928)=0.0193

According to the maximum gain of the antenna and the total output power to the antenna, through calculation, we will know max MPE value 0.0193 at distance 20cm. This is less than the limit 1, So Compliance the RF exposure requirement.