RF Exposure Report

FCC ID:2AEWI-ER-600

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

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.

Conducted Power

2.4G WIFI

Mode	Channel	Frequency	Peak Conducted Output Power (dBm)
IEEE 802.11b	1	2412	13.68
	7	2437	13.45
	13	2462	13.37
IEEE 802.11g	1	2412	12.82
	7	2437	12.66
	13	2462	12.29
IEEE 802.11n HT20	1	2412	11.45
	7	2437	11.52
	13	2462	11.27
IEEE 802.11n HT40	3	2422	11.42
	7	2437	11.23
	11	2452	11.11

LTE Band7

Modulation	Channel	Average Power [dBm]			
		5 MHz	10 MHz	15 MHz	20 MHz
QPSK	LCH	22.67	22.32	22.51	22.55
	MCH	21.11	22.57	22.68	22.31
	HCH	22.34	22.46	21.45	23.63
16QAM	LCH	21.09	21.81	21.12	21.48
	MCH	21.68	21.45	21.24	21.17
	HCH	21.41	21.53	21.62	21.04

Manufacturing Tolerance

2.4GWIFI

802.11b(Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13.0	13.0	13.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11g(Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	12.0	12.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11n(HT20) (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.0	11.0	11.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11n(HT40) (Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	11.0	11.0	11.0
Tolerance ±(dB)	1.0	1.0	1.0

LTE Band 7

Maximum Output Power			
Band 7			
Target (dBm)	23.0		
Tolerance ±(dB)	2.0		

Standalone MPE Result

Gain of antenna in Logarithmic=0 dBi
Gain of antenna in linear scale=1 dBi
2412-2462MHz:

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11b	14.00	25.1189	1.00	1.2589	100%	0.0063	1.0000
IEEE 802.11g	13.00	19.9526	1.00	1.2589	100%	0.0050	1.0000
IEEE 802.11n HT20	12.00	15.8489	1.00	1.2589	100%	0.0040	1.0000
IEEE 802.11n HT40	12.00	15.8489	1.00	1.2589	100%	0.0040	1.0000

FDD-LTE
Gain of antenna in Logarithmic=0 dBi
Gain of antenna in linear scale=1 dBi
2500-2570MHz:

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
LTE Band 7	25.00	316.2278	1.00	1.2589	100%	0.0792	1.0000

Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Synchronization transmit
2.4G WIFI	2.4GHz	Yes
LTE Band 7	2500-2570MHz	

Summary simultaneous transmission results

2.4GWLAN and LTE Band 7

Modulation Type	MPE (mW/cm^2)	∑MPE ratios	Limit	Results
2.4G WIFI	0.0063	0.0855	1.0	PASS
LTE Band 7	0.0792			

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.