

1 Human Exposure Assessment

1.1 Maximum Permissible Exposure

1.1.1 Limit of Maximum Permissible Exposure

Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6
Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30
Note 1: f = frequency in MHz ; *Plane-wave equivalent power density				
Note 2: For the applicable limit, see FCC 1.1310				

1.1.2 MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

E = Electric field (V/m)

G = EUT Antenna numeric gain (numeric)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

P = RF output power (W)

d = Separation distance between radiator and human body (m)

1.2 Result of Maximum Permissible Exposure

For 2.4GHz Band:

Configuration 802.11b

<Ant.1>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2412	1.82	1.5205	22.81	190.9853	0.0578	1	Complies

<Ant.2>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2462	2.38	1.7298	24.58	287.0781	0.0988	1	Complies

Configuration 802.11g
<Ant.1>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	2.99	1.9907	25.77	377.5722	0.1495	1	Complies

<Ant.2>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	2.12	1.6293	27.03	504.6613	0.1636	1	Complies

<Ant.1+2, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	3.15	2.0654	28.58	721.1075	0.2963	1	Complies

Configuration 802.11n 20MHz
<MCS0, Ant.1>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	2.99	1.9907	25.52	356.4511	0.1412	1	Complies

<MCS0, Ant.2>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	2.12	1.6293	26.72	469.8941	0.1523	1	Complies

<MCS0, Ant.1+2, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	3.15	2.0654	29.36	862.9785	0.3546	1	Complies

Configuration 802.11n 40MHz
<MCS0, Ant.1>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	2.99	1.9907	20.31	107.3989	0.0425	1	Complies

<MCS0, Ant.2>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	2.12	1.6293	21.53	142.2329	0.0461	1	Complies

<MCS0, Ant.1+2, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
2.4GHz WLAN	2437	3.15	2.0654	23.43	220.2926	0.0905	1	Complies



For 5GHz Band 2 & Band 3:

Configuration 802.11a

<6 Mbps, Ant.1+2+3+4, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5260	5.94	3.9264	21.94	156.3581	0.1221	1	Complies

Configuration 802.11ac 20MHz
<Nss1 MCS0, Ant.1+2+3+4, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5500	6.48	4.4463	21.77	150.2088	0.1329	1	Complies

<Nss2 MCS0, Ant.1+2+3+4, TxBF>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5500	3.53	2.2542	23.17	207.6478	0.0931	1	Complies

<Nss3 MCS0, Ant.1+2+3+4, TxBF>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5320	5.27	3.3651	23.57	227.3487	0.1522	1	Complies

Configuration 802.11ac 40MHz
<<Nss1 MCS0, Ant.1+2+3+4, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5310	6.11	4.0832	23.41	219.2258	0.1781	1	Complies

<Nss2 MCS0, Ant.1+2+3+4, TxBF>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5270	3.04	2.0137	23.93	247.3066	0.0991	1	Complies

<Nss3 MCS0, Ant.1+2+3+4, TxBF>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5270	5.11	3.2434	23.32	214.8725	0.1386	1	Complies

Configuration 802.11ac 80MHz
<<Nss1 MCS0, Ant.1+2+3+4, CDD>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5290	5.79	3.7931	23.07	202.9860	0.1532	1	Complies

<Nss2 MCS0, Ant.1+2+3+4, TxBF>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5290	3.04	2.0137	22.68	185.3396	0.0742	1	Complies

<Nss3 MCS0, Ant.1+2+3+4, TxBF>

Test Mode	Test Freq (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average output Power (dBm)	Average output Power (mW)	Power Density(S) (mW/cm ²)	Limit of power density (S) (mW/cm ²)	Test Result
5GHz WLAN	5290	5.24	3.3420	22.89	194.5911	0.1294	1	Complies

Worst Maximum Permissible Exposure Result				
Separation Distance (cm)	20			
Modulation Mode	Test Freq (MHz)	Antenna Gain (dBi)	Average output Power (dBm)	PD (S) (mW/cm ²)
2.4 GHz WLAN 802.11n 20MHz	2437	3.15	29.36	0.3546
5 GHz WLAN 802.11ac 40MHz	5310	6.11	23.41	0.1781
Co-location Total				0.5327
Maximum Permissible Exposure Limit (mW/cm ²)				1