

# 1 Maximum Permissible Exposure

## 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842 / f	4.89 / f	(900 / f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1,500			F/300	6
1,500-100,000			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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1,500			F/1500	30
1,500-100,000			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

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

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

**P** = RF output power (W)

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

**1.1.3 Result of Maximum Permissible Exposure**

RF General Information 5150~5250MHz						
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N <sub>TX</sub> )	RF Output Power (dBm)	Co-location
5150-5250	a	5180-5240	36-48 [4]	1	14.68	Yes
5150-5250	n (HT20)	5180-5240	36-48 [4]	1	14.67	Yes
5150-5250	n (HT40)	5190-5230	38-46 [2]	1	16.71	Yes
5150-5250	ac (VHT20)	5180-5240	36-48 [4]	1	15.02	Yes
5150-5250	ac (VHT40)	5190-5230	38-46 [2]	1	16.69	Yes
5150-5250	ac (VHT80)	5210	42 [1]	1	16.92	Yes

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.  
 Note 2: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)

RF General Information 5725 MHz – 5850 MHz						
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N <sub>TX</sub> )	RF Output Power (dBm)	Co-location
5725-5850	a	5745-5825	149-165 [5]	1	21.89	Yes
5725-5850	n(HT20)	5745-5825	149-165 [5]	1	21.81	Yes
5725-5850	n(HT40)	5755-5795	151-159 [2]	1	21.68	Yes
5725-5850	ac(VHT20)	5745-5825	149-165 [5]	1	21.21	Yes
5725-5850	ac(VHT40)	5755-5795	151-159 [2]	1	21.13	Yes
5725-5850	ac(VHT80)	5775	155 [1]	1	17.79	Yes

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.  
 Note 2: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)

RF General Information 2400 MHz – 2483.5 MHz						
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N <sub>TX</sub> )	RF Output Power (dBm)	Co-location
2400-2483.5	b	2412-2462	1-11 [11]	1	18.33	Yes
2400-2483.5	g	2412-2462	1-11 [11]	1	18.79	Yes
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	22.16	Yes
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	18.22	Yes

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.  
 Note 2: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)



<b>Worst Maximum RF Output Power Result</b>					
<b>Exposure Environment</b>		General Population / Uncontrolled Exposure			
<b>Separation Distance (cm)</b>		20			
<b>Condition</b>		<b>RF Output Power (dBm)</b>			
<b>Modulation Mode</b>	<b>N<sub>TX</sub></b>	<b>RF Output Power (dBm)</b>	<b>DG (dBi)</b>	<b>EIRP Power</b>	<b>PD (S) (mW/cm<sup>2</sup>)</b>
11N-VHT80	1	16.92	4.44	21.36	0.027
11A	1	21.89	4.44	26.33	0.085
11N-HT20	2	22.16	2.71	24.87	0.061
<b>Co-location Total</b>					0.173
<b>Maximum Permissible Exposure Limit (mW/cm<sup>2</sup>)</b>					1
Note 1: N <sub>TX</sub> = Number of Transmit Chains					