

# RF Exposure Statement

## 1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (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 - 1500.....	.....	.....	f/1500	30
1500 - 100.000.....	.....	.....	1.0	30

F = frequency in MHz

\* = Plane-wave equivalent power density

## 2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

### 3. RESULTS (DTS BAND)

#### Monitoring port

##### 3-1. 2.4 GHz BAND

Max Peak output Power at antenna input terminal (dBm)	24.1500
Max Peak output Power at antenna input terminal (mW)	260.016
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	2462.00000
Antenna Gain(Peak) (dBi)	10.74000
Antenna Gain(numeric)	11.85769
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.098141
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

#### Service port

##### 3-2. 2.4 GHz BAND

Max Peak output Power at antenna input terminal (dBm)	24.4800
Max Peak output Power at antenna input terminal (mW)	280.543
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	2412.00000
Antenna Gain(Peak) (dBi)	8.08000
Antenna Gain(numeric)	6.42688
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.057392
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

#### 4. RESULTS (UNII 1 BAND)

##### **Monitoring Port**

##### 4-1 802.11a (5180 ~ 5240)

Max Average output Power at antenna input terminal (dBm)	7.8400
Max Average output Power at antenna input terminal (mW)	6.081
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5260.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.002460
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

##### **Service Port**

##### 4-2 802.11a (5180~ 5240)

Max Average output Power at antenna input terminal (dBm)	9.5200
Max Average output Power at antenna input terminal (mW)	8.954
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5795.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.003621
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

4-3 802.11n 20MHz BW(5180 ~ 5240)

Max Average output Power at antenna input terminal (dBm)	8.2300
Max Average output Power at antenna input terminal (mW)	6.653
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5320.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.002691
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

4-4 802.11n 40MHz BW (5190 ~ 5230)

Max Average output Power at antenna input terminal (dBm)	10.6200
Max Average output Power at antenna input terminal (mW)	11.535
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5190.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.004665
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

4-5 802.11ac 20 MHz BW (5180 ~ 5240)

Max Average output Power at antenna input terminal (dBm)	8.4500
Max Average output Power at antenna input terminal (mW)	6.998
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5180.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.002830
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

4-6 802.11ac 40MHz BW (5190~ 5230)

Max Average output Power at antenna input terminal (dBm)	9.6500
Max Average output Power at antenna input terminal (mW)	9.226
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5190.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.003731
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

4-7 802.11ac 80MHz BW (5210)

Max Average output Power at antenna input terminal (dBm)	8.7700
Max Average output Power at antenna input terminal (mW)	7.534
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5210.00000
Antenna Gain(Peak) (dBi)	11.04000
Antenna Gain(numeric)	12.70574
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.003047
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**5. RESULTS (UNII 2A, 2C BAND)**

**Monitoring Port**

**5-1 802.11a (5260~ 5320) UNII 2A**

Max Average output Power at antenna input terminal (dBm)	16.0400
Max Average output Power at antenna input terminal (mW)	40.179
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5260.00000
Antenna Gain(Peak) (dBi)	11.81000
Antenna Gain(numeric)	15.17050
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.019402
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**5-2 802.11a (5500~ 5720) UNII 2C**

Max Average utput Power at antenna input terminal (dBm)	16.3700
Max Average output Power at antenna input terminal (mW)	43.351
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5720.00000
Antenna Gain(Peak) (dBi)	12.18000
Antenna Gain(numeric)	16.51962
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.022796
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

Service Port

5-3 802.11a BW (5260~5320) UNII 2A

Max Average output Power at antenna input terminal (dBm)	14.4300
Max Average output Power at antenna input terminal (mW)	27.733
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5260.00000
Antenna Gain(Peak) (dBi)	11.81000
Antenna Gain(numeric)	15.17050
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.013392
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-4 802.11a BW (5500~5720) UNII 2C

Max Average output Power at antenna input terminal (dBm)	15.6600
Max Average output Power at antenna input terminal (mW)	36.813
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5720.00000
Antenna Gain(Peak) (dBi)	10.69000
Antenna Gain(numeric)	11.72195
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.013736
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-5 802.11n 20MHz BW(5260 ~ 5320) UNII 2A

Max Average output Power at antenna input terminal (dBm)	14.4100
Max Average output Power at antenna input terminal (mW)	27.606
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5260.00000
Antenna Gain(Peak) (dBi)	11.08000
Antenna Gain(numeric)	12.82331
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.011268
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-6 802.11n 20MHz BW(5500~ 5720) UNII 2C

Max Average output Power at antenna input terminal (dBm)	16.3300
Max Average output Power at antenna input terminal (mW)	42.954
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5580.00000
Antenna Gain(Peak) (dBi)	10.69000
Antenna Gain(numeric)	11.72195
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.016027
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-7 802.11ac 20MHz BW(5260~ 5320) UNII 2A

Max Average output Power at antenna input terminal (dBm)	14.9200
Max Average output Power at antenna input terminal (mW)	31.046
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5260.00000
Antenna Gain(Peak) (dBi)	11.08000
Antenna Gain(numeric)	12.82331
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.012672
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-8 802.11ac 20MHz BW(5500~ 5720) UNII 2C

Max Average output Power at antenna input terminal (dBm)	16.1200
Max Average output Power at antenna input terminal (mW)	40.926
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5720.00000
Antenna Gain(Peak) (dBi)	10.69000
Antenna Gain(numeric)	11.72195
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.015270
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**5-9 802.11n 40MHz BW(5270~ 5310) UNII 2A**

Max Average output Power at antenna input terminal (dBm)	10.8500
Max Average output Power at antenna input terminal (mW)	12.162
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5270.00000
Antenna Gain(Peak) (dBi)	11.08000
Antenna Gain(numeric)	12.82331
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.004964
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**5-10 802.11n 40MHz BW(5510~ 5710) UNII 2C**

Max Average output Power at antenna input terminal (dBm)	18.0800
Max Average output Power at antenna input terminal (mW)	64.269
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5710.00000
Antenna Gain(Peak) (dBi)	10.69000
Antenna Gain(numeric)	11.72195
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.023980
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-11 802.11ac 40MHz BW(5270~ 5310) UNII 2A

Max Average output Power at antenna input terminal (dBm)	10.7400
Max Average output Power at antenna input terminal (mW)	11.858
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5270.00000
Antenna Gain(Peak) (dBi)	11.08000
Antenna Gain(numeric)	12.82331
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.004840
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-12 802.11ac 40MHz BW(5510~ 5710) UNII 2C

Max Average output Power at antenna input terminal (dBm)	18.0600
Max Average output Power at antenna input terminal (mW)	63.973
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5710.00000
Antenna Gain(Peak) (dBi)	10.69000
Antenna Gain(numeric)	11.72195
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.023870
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-13 802.11ac 80MHz BW(5290) UNII 2A

Max Average output Power at antenna input terminal (dBm)	9.1600
Max Average output Power at antenna input terminal (mW)	8.241
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5290.00000
Antenna Gain(Peak) (dBi)	11.08000
Antenna Gain(numeric)	12.82331
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.003364
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

5-14 802.11ac 80MHz BW(5530~ 5690) UNII 2C

Max Average output Power at antenna input terminal (dBm)	18.0900
Max Average output Power at antenna input terminal (mW)	64.417
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5690.00000
Antenna Gain(Peak) (dBi)	10.69000
Antenna Gain(numeric)	11.72195
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.024035
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

6. RESULTS (UNII 3 BAND)

Monitoring Port

6-1.UNII 3 BAND

Max Average output Power at antenna input terminal (dBm)	13.5400
Max Average output Power at antenna input terminal (mW)	22.594
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5745.00000
Antenna Gain(Peak) (dBi)	11.23000
Antenna Gain(numeric)	13.27394
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.009547
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

Service port

6-2. 802.11a 20MHz BW(5745~ 5825) UNII 3

Max Average output Power at antenna input terminal (dBm)	15.5100
Max Average output Power at antenna input terminal (mW)	35.563
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5785.00000
Antenna Gain(Peak) (dBi)	10.26000
Antenna Gain(numeric)	10.61696
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.012018
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**6-3. 802.11n 20MHz BW(5745~ 5825) UNII 3**

Max Average output Power at antenna input terminal (dBm)	15.1500
Max Average output Power at antenna input terminal (mW)	32.734
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5825.00000
Antenna Gain(Peak) (dBi)	10.26000
Antenna Gain(numeric)	10.61696
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.011062
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**6-4. 802.11ac 20MHz BW(5745~ 5825) UNII 3**

Max Average output Power at antenna input terminal (dBm)	14.9800
Max Average output Power at antenna input terminal (mW)	31.477
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5825.00000
Antenna Gain(Peak) (dBi)	10.26000
Antenna Gain(numeric)	10.61696
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.010638
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**6-5. 802.11n 40MHz BW(5755~ 5795) UNII 3**

Max Average output Power at antenna input terminal (dBm)	14.8000
Max Average output Power at antenna input terminal (mW)	30.200
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5795.00000
Antenna Gain(Peak) (dBi)	10.26000
Antenna Gain(numeric)	10.61696
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.010206
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**6-6. 802.11ac 40MHz BW(5755~ 5795) UNII 3**

Max Average output Power at antenna input terminal (dBm)	16.3200
Max Average output Power at antenna input terminal (mW)	42.855
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5755.00000
Antenna Gain(Peak) (dBi)	10.26000
Antenna Gain(numeric)	10.61696
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.014483
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

6-7. 802.11ac 80MHz BW(5775) UNII 3

Max Average output Power at antenna input terminal (dBm)	11.3200
Max Average output Power at antenna input terminal (mW)	13.552
Prediction distance (cm)	50.00000
Prediction frequency (MHz)	5775.00000
Antenna Gain(Peak) (dBi)	10.26000
Antenna Gain(numeric)	10.61696
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.004580
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**7. RESULTS**

**7-1. BT LE**

Max Peak output Power at antenna input terminal (dBm)	8.6280
Max Peak output Power at antenna input terminal (mW)	7.291
Prediction distance (cm)	20.00000
Prediction frequency (MHz)	2402.00000
Antenna Gain(Peak) (dBi)	2.93000
Antenna Gain(numeric)	1.96336
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.002848
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

**7-2. ZigBee**

Max Peak output Power at antenna input terminal (dBm)	5.1300
Max Peak output Power at antenna input terminal (mW)	3.258
Prediction distance (cm)	20.00000
Prediction frequency (MHz)	2405.00000
Antenna Gain(Peak) (dBi)	3.46000
Antenna Gain(numeric)	2.21820
Power density at prediction frequency (mW/cm <sup>2</sup> )	0.001438
MPE limit for uncontrolled exposure at prediction frequency (mW/cm <sup>2</sup> )	1.00000

## 8. RESULTS

### BT LE BAND

1. The power density level at 50 cm is **0.002848 mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at BT LE BAND**
2. The power density level at 50 cm is **0.024035mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at UNII 2C**

->Simultaneous MPE 50cm is  $(0.002848/1.0) + (0.024035/1.0) < 1$

\* The Worst case Adapter BT LE: 8.628 dBm , UNII 2C 3Tx MiMo: 18.09dBm is Highest Power

### ZigBee BAND

1. The power density level at 50 cm is **0.0001438 mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at ZigBee BAND**
2. The power density level at 50 cm is **0.024035mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at UNII 2C**

->Simultaneous MPE 50cm is  $(0.0001438/1.0) + (0.024035/1.0) < 1$

\* The Worst case Adapter ZigBee: 5.13 dBm , UNII 2C 3Tx MiMo: 18.09 dBm is Highest Power

## DTS BAND

### Monitoring Port

3. The power density level at 50 cm is **0.098141 mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at 2.4GHz BAND**
4. The power density level at 50 cm is **0.024035 mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at UNII 2C**

->Simultaneous MPE 50cm is  $(0.098141/1.0) + (0.024035/1.0) < 1$

\* The Worst case Adapter 2.4 GHz 3TX MiMO: 24.15 dBi , UNII2C 3Tx MiMo: 18.09 dBi is Highest Power

### Service Port

1. The power density level at 50 cm is **0.057392 mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at 2.4GHz BAND**
2. The power density level at 50 cm is **0.024035mW/cm<sup>2</sup>**, which is below the uncontrolled exposure limit of **1.0 mW/cm<sup>2</sup> at UNII 2C**

->Simultaneous MPE 50cm is  $(0.057392/1.0) + (0.024035/1.0) < 1$

\* The Worst case Adapter 2.4 GHz 3TX MiMO: 24.48 dBi , 5 UNII 2C 3Tx MiMo: 18.09 dBi is Highest Power