Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output and RF Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Calculation – Wistron Module: 2.4GHz (NKRCM9)

MPE Limit Calculation: EUT's operating frequencies @ 2412-2462 MHz; highest conducted power = 22.92dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **4.5dBi**

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

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (195.8845mW)
G = Antenna Gain (2.81 numeric)

$S = (195.8845*2.81/4*3.14*20.0^2) = (552.0774 / 5024) =$ **0.109mW/cm^2** @ 20cm separation

MPE Limit Calculation: EUT's operating frequencies @ 2412-2462 MHz; highest conducted power = 22.92dBm (peak)

EUT maximum antenna gain = **9dBi**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (195.8845mW)
G = Antenna Gain (7.94 numeric)

$S = (195.8845*7.94/4*3.14*20.0^2) = (1555.966 / 5024) =$ **0.309mW/cm^2** @ 20cm separation

MPE Limit Calculation: EUT's operating frequencies @ 2412-2462 MHz; highest conducted power = 22.92dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **16dBi**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (195.8845mW)
G = Antenna Gain (39.81 numeric)

$R = (195.8845*39.81/ 4*3.14*1.0)^{1/2} = (7798.301/ 12.56)^{1/2} =$ **24.9cm**

MPE Calculation – Wistron Module: 2.4GHz (FCC ID: NKRDCMA82)

MPE Limit Calculation: EUT's operating frequencies @ 2412-2462 MHz; highest conducted power = 25.59dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **4.5dBi Omni**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (362.243mW)
G = Antenna Gain (2.81 numeric)

S = (362.243*2.81/4*3.14*20.0^2) = (1020.939/ 5024) = **0.203mW/cm^2** @ 20cm separation

MPE Limit Calculation: EUT's operating frequencies @ 2412-2462 MHz; highest conducted power = 25.59dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **9dBi Omni**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (362.243mW)
G = Antenna Gain (7.94 numeric)

S = (362.243*7.94/4*3.14*20.0^2) = (2877.398 / 5024) = **0.572mW/cm^2** @ 20cm separation

MPE Limit Calculation: EUT's operating frequencies @ 2412-2462 MHz; highest conducted power = 25.59dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **16dBi Sector**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (362.243mW)
G = Antenna Gain (39.81 numeric)

R = (362.243*39.81/ 4*3.14*1.0)$^{1/2}$ = (14421.15 / 12.56) $^{1/2}$ = **33.88cm**

MPE Calculation – Wistron Module: 5.8GHz (FCC ID: NKRDCMA82)

MPE Limit Calculation: EUT's operating frequencies @ 5745-5825 MHz; highest conducted power = 25.79dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **10dBi Omni**

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (379.315mW)
G = Antenna Gain (10 numeric)

$S = (379.315*10/4*3.14*20.0^2) = (3793.15/ 5024) =$ **0.755mW/cm^2** @ 20cm separation

MPE Limit Calculation: EUT's operating frequencies @ 5745-5825 MHz; highest conducted power = 25.79dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **16dBi Sector**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (379.315mW)
G = Antenna Gain (39.81 numeric)

$R = (379.315*39.81/ 4*3.14*1.0)^{1/2} = (15100.8 / 12.56)^{1/2} =$ **34.67cm**

MPE Limit Calculation: EUT's operating frequencies @ 5745-5825 MHz; highest conducted power = 25.79dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = **19dBi Directional**

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (379.315mW)
G = Antenna Gain (79.43 numeric)

$R = (379.315*79.43/ 4*3.14*1.0)^{1/2} = (30130.06 / 12.56)^{1/2} =$ **48.97cm**