RF Exposure

The WRE2700 (800 / 1900 MHz) dual band RF Compensator is operated as a signal booster as defined in 2.1091(b) based on its design and installation. The compensator is installed in such a way that it is physically secured and is generally located more than 20 cm from the end-user. This information is included in the user manual. It is suggested that the antenna be installed such that there is at least 20 cm of separation between user and the antenna.

RF Exposure – MPE Calculations

Input

Transmitter Power:	1222 mW	@ 824-849MHz	(Uplink)
	4.5 mW	@ 869-894MHz	(Downlink)
	564 mW	@ 1850-1910MHz	(Uplink)
	1.8 mW	@ 1930-1990MHz	(Downlink)

Antenna Gain: 3 dBi all cases

Cable loss: 2.0 dB @ 824–849 MHz and 869-894MHz
4.0 dB @ 1850–1910 MHz and 1930-1990MHz

Frequency range:	824-849MHz and 1850-1910MHz	(Uplink)
	869-894MHz and 1930-1990MHz	(Downlink)

Assumptions

1. A single ¼ wavelength radiating antenna is assumed.
2. Closest exposure distance is assumed to be 20 cm
3. Using the formula Level 1/Limit1 + Level2/Limit2 to show predicted total RF exposure if both bands are operating simultaneously, result must be less than 1.

   Where: Limit 1 is the limit in the uplink band
   Limit 2 is the limit in the downlink band
   Level 1 is the calculated maximum RF exposure in the uplink band
   Level 2 is the calculated maximum RF exposure in the downlink band

824-894 Band (Uplink and Downlink)

Combined Worst Case Exposure = 0.6465961 is less than 1 = compliant

1850-1990 Band (Uplink and Downlink)

Combined Worst Case Exposure = 0.0022254 is less than 1 = compliant

RF Exposure – MPE Calculations

Calculations for Uplink

The following results shall be assumed to be accurate for the far-field only. These predictions will over-estimate power density in the near–field. Based on the use of a ¼ wavelength radiator, a distance of 20 cm is considered to be in the far-field for all cases.

$S = PG/4*PI*R^2$

@ 824 – 849 MHz

P is 1222 mW
G is 1.0 dBi (Antenna gain – loss) or $10^{(1.0/10)}$ or 1.259 Numerical
R is 20 cm

S = 0.306212mW/cm²

For Occupational/Controlled Exposure
From 300 to 1500 MHz, power density limit is f/300 mW/cm²
@ 824 MHz, power density limit is **2.747 mW/cm² for 6 minutes.**

For General Population/Uncontrolled Exposure
From 300 to 1500 MHz, power density limit is f/1500 mW/cm²
@ 824 MHz, Power density limit is **0.549 mW/cm² for 30 minutes.**

Conclusion: **Meets MPE limits**

@ 1850 – 1910 MHz

P is 564 mW
G is -1.0 dBi (Antenna gain – loss) or $10^{(-1.0/10)}$ or 0.794 Numerical
R is 20 cm

S = 0.089172mW/cm²

For Occupational/Controlled Exposure
From 1,500 to 100,000 MHz, power density limit is **5 mW/cm² for 6 minutes.**

For General Population/Uncontrolled Exposure
From 1,500 to 100,000 MHz, power density limit is **1 mW/cm² for 30 minutes.**

Conclusion: **Meets MPE limits**

RF Exposure – MPE Calculations

Calculations for Downlink

The following results shall be assumed to be accurate for the far-field only. These predictions will over-estimate power density in the near–field. Based on the use of a ¼ wavelength radiator, a distance of 20 cm is considered to be in the far-field for all cases.

$S = PG/4*PI*R^2$

@ 869 – 894 MHz

P is 4.5 mW
G is 1.0 dBi (Antenna gain – loss) or $10^{(1.05/10)}$ or 1.259 Numerical
R is 20 cm

S = 0.001127mW/cm^2

For Occupational/Controlled Exposure
From 300 to 1500 MHz, power density limit is f/300 mW/cm^2
@ 869 MHz, power density limit is **2.897 mW/cm^2 for 6 minutes.**

For General Population/Uncontrolled Exposure
From 300 to 1500 MHz, power density limit is f/1500 mW/cm^2
@ 869 MHz, Power density limit is **0.579 mW/cm^2 for 30 minutes.**

Conclusion: **Meets MPE limits**

@ 1930 – 1990 MHz

P is 1.8 mW
G is -1.0 dBi (Antenna gain – loss) or $10^{(-1.0/10)}$ or 0.794 Numerical
R is 20 cm

S = 0.000280mW/cm^2

For Occupational/Controlled Exposure
From 1,500 to 100,000 MHz, power density limit is **5 mW/cm^2 for 6 minutes.**

For General Population/Uncontrolled Exposure
From 1,500 to 100,000 MHz, power density limit is **1 mW/cm^2 for 30 minutes.**

Conclusion: **Meets MPE limits**