Maximum Permissible Exposure calculations

The MPE distance will be calculated for the worst case of a 100% transmitter duty cycle. For an isotropic radiator the surface area of a sphere can be used to determine the area over which the transceiver energy is radiated.

*Surface area of a sphere = 4 * π * radius*^{2}

In the case where there is an antenna gain, the worst case energy density is increased by the antenna gain. In this case, the exposure level for a controlled environment can be calculated as follows:

The exposure level at a 20 cm distance from the EUT's transmitting antenna is calculated using the general equation:

$$S = \frac{P * G}{4 * \pi * R^2}$$

Radio	Tx Freq(MHz)	Max Power (mWatts)	Ant. Gain (dB)	Pwr Density (mW/cm^2)	Limit (mW/cm^2)
Wifi/BT	**2400**	**46.7**	**0.5**	**0.010**	**1**
Badger Meter	**915**	**11**	**2.0**	**0.003**	**0.61**

Worst Case Co-located Exposure Conditions

Both radios transmitting at the exact same instant

Per Note 24 shown below, the Sum of Worst Case Power Ratios cannot exceed 1.0

WiFi/ Bluetooth Worst Case Ratio of Power Density to the Exposure Limit	Badger Meter Worst Case Ratio of Power Density to the Exposure Limit	Sum of Worst Case Ratios (Power Density to the Exposure Limit)	FCC Limit for Sum of Worst Case Ratios
0.010	0.003	0.013	1

The results shown in the above table are equivalent to the Sum of the EIRP of the Four Co-located Transmitters (EIRP TX1 + EIRP TX2) compared to the exposure limit. The benefit of this method, is that accounts for transmitters operating at different frequencies against different exposure limits.

Excerpts from TCB Training, April 3, 2002, "Mobile Transmitters", Slide 6:
"Devices operating in multiple frequency bands

- When RF exposure evaluation is required for TCB approval
- Separate antennas – estimated minimum separation distances may be considered for the frequency bands that do not require evaluation or TCB approval, however, the estimated distance should take into account the effect of co-located transmitters. (Note 24)

Note 24 - According to multiple frequency exposure criteria the ratio of field strength or power density to the applicable exposure limit at the exposure location should be determined for each transmitter and the sum of these ratios must not exceed 1.0 for the location to be compliant."

The sum of the ratios (power density to the exposure limit) does not exceed 1.0; therefore, the exposure condition is compliant with FCC rules