


FCC PART 1.1310	
REPORT NO.: ATMPE00001	

## RF Human Exposure Analysis as per 47CFR§1.1310

### 1. Guidelines

For transmitters operating in the 824-849 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to  $f/1500$  mW/cm<sup>2</sup> for uncontrolled environments and  $f/300$  mW/cm<sup>2</sup> for controlled environments.

For transmitters operating in the 1850-1910 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to 1 mW/cm<sup>2</sup> for uncontrolled environments and 5 mW/cm<sup>2</sup> for controlled environments.

The far field on-axis power flux density (W/m<sup>2</sup>) is calculated using the following formula:

$$S = G P_T / 4\pi R^2 \quad (1)$$

Where:

- S = Power density (in appropriate units, e.g. mW/cm<sup>2</sup>)
- G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
- P<sub>T</sub> = Power input to the antenna (in appropriate units, e.g., mW)
- R = Distance to the center of radiation of the antenna (appropriate units, e.g., cm)

It is important to note that the power gain factor, **G**, in Equation (1) is normally *numeric* gain. Therefore, when power gain is expressed in logarithmic terms, i.e., dB, a conversion is required using the relation:


$$G = 10^{(dB/10)}$$

For example, a logarithmic power gain of 14 dB is equal to a numeric gain of 25.12.

### 2. SA200 Cellular Signal Amplifier Particulars

The following table shows the maximum output power of the signal amplifier combined with an antenna with 3dBi gain. This is the maximum antenna gain permissible as documented in the user/installation manual. The resulting radiated power density is compared to MPE limits for both uncontrolled and controlled environments.

<b>Company:</b>	<b>Arrista Technologies Inc.</b>	
<b>Equipment:</b>	<b>SA200 Cellular Signal Amplifier</b>	<i>Page 1</i>

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### 3. Cellular Band (824-849MHz)

Table 1. Cellular Band MPE Calculations

<b>Output power of the amplifier:</b>	1.36 W maximum	
<b>Antenna Gain:</b> Maximum antenna gain allowed as described in user/installation manual.	3dBi	
<b>Operational Frequency:</b>	824-849MHz	
<b>Minimum distance (Controlled):</b> From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	50cm Antenna mounted on vehicle exterior	
<b>Minimum distance (Uncontrolled):</b> From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	50cm Antenna mounted on vehicle exterior	
<b>Calculated RF Power Density:</b>	0.0864 mW/cm <sup>2</sup>	
<b>Maximum Permissible Exposure (MPE):</b>	<b>Controlled</b> 6 min avg exposure 2.75mW/cm <sup>2</sup>	<b>Uncontrolled</b> 30 min avg exposure 0.55mW/ cm <sup>2</sup>
<b>Complies with MPE Limits</b>	<b>Yes</b>	<b>Yes</b>

### 4. Calculations


$$S = G P_T / 4\pi R^2 \quad (1)$$

$$S = (1.995 * 1.36 * 10^3) / (4\pi * 50^2)$$

$$S = 2713 / (10000\pi)$$

$$S = 0.0864 \text{ mW/cm}^2$$

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<b>Equipment:</b>	<i>SA200 Cellular Signal Amplifier</i>	<i>Page 2</i>

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## 5. PCS Band (1850-1910MHz)

Table 2. PCS Band MPE Calculations

<b>Output power of the amplifier:</b>	1.00 W maximum	
<b>Antenna Gain:</b> Maximum antenna gain allowed as described in user/installation manual.	3dBi	
<b>Operational Frequency:</b>	1850-1910MHz	
<b>Minimum distance (Controlled):</b> From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	0.5m Antenna mounted on vehicle exterior	
<b>Minimum distance (Uncontrolled):</b> From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	0.5m Antenna mounted on vehicle exterior	
<b>Calculated RF Power Density:</b>	0.064 mW/cm <sup>2</sup>	
<b>Maximum Permissible Exposure (MPE):</b>	<b>Controlled</b> 6 min avg exposure 5 mW/cm <sup>2</sup>	<b>Uncontrolled</b> 30 min avg exposure 1 mW/cm <sup>2</sup>
<b>Complies with MPE Limits</b>	<b>Yes</b>	<b>Yes</b>

## 6. Calculations

$$S = G P_T / 4\pi R^2, \quad (1)$$

$$S = (1.995 * 1.00 * 10^3) / (4\pi * 50^2)$$

$$S = 1995 / (10000\pi)$$

$$S = 0.0635 \text{ mW/cm}^2$$

The following instructions will be placed in the User/Installation Manual instructing installers and users to maintain the minimum MPE distances during operation of the EUT:

**"NOTICE: During transmitter operation, a minimum distance of 50cm (20 in.) shall be maintained between the antenna and personnel, in order to meet the maximum permissible exposure (MPE) limits in section 1.1310 of FCC Rules."**

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<b>Equipment:</b>	<i>SA200 Cellular Signal Amplifier</i>	<i>Page 3</i>