ARRISTA
Technologies Inc.

RF Exposure Analysis:
Report: MPE00008

Applicant:
Arrista Technologies Inc.
5-55 Henlow Bay
Winnipeg, MB, CA
R3Y 1G4

Equipment Under Test (EUT):
TDMA / CDMA / GSM
Bi-Directional Cellular Signal Amplifier

MODEL:
CR500

FCC ID:
P35WYPCJTE6

IN ACCORDANCE WITH:
FCC PART 2, FCC PART 24,
CELLULAR BAND REPEATERS

1.1. GENERAL EQUIPMENT SPECIFICATION

1.1.1. POWER SUPPLY SPECIFICATIONS

Input Voltage: 12 Vdc
Input Current: 1 Amp max

1.1.2. UPLINK

Frequency Range: 1850 – 1910 MHz
Tunable Bands: Not Applicable
Necessary Bandwidth: Not Applicable
Type of Modulation: Not Applicable
Internal/External Data Source: Not Applicable
Emission Designator: DXW, F9W, GXW
Output Impedance: 50 Ohms
RF Power Output (rated):   Single, leveled, up to 200 mWatts
Number of Channels: Not Applicable
Duty Cycle: Continuous, Linear Class A
Channel Spacing: Not Applicable
Band Selection   Duplexer

1.1.3. DOWNLINK

Frequency Range: 1930 – 1990 MHz
Tunable Bands: Not Applicable
Necessary Bandwidth: Not Applicable
Type of Modulation: Not Applicable
Local Oscillator: Not Applicable
Emission Designator: DXW, F9W, GXW
Output Impedance: 50 Ohms
RF Power Output (rated):   Single/Dual; User Selectable; leveled; up to 30mW/port
Number of Channels: Not Applicable
Duty Cycle: Continuous, Linear Class A
Channel Spacing: Not Applicable
Band Selection   Duplexer
1st IF: Not Applicable
2nd IF: Not Applicable

1.1.4. RF EXPOSURE

Test Type:	Maximum Permissible Exposure
FCC Para No.:	1.1310, 2.1093
Tested By:	Paul Eberling
Date:	December 8, 2004

1.1.4.1. SPECIFICATION REQUIREMENT:

As per FCC 47CFR§1.1301; FCC OET Bulletin 65, 97-01 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" and FCC OET Bulletin 65, Supplement C, 01-01, "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", for transmitters operating in the 1850-1910 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to f/1500 mW/cm^2 for uncontrolled environments and f/300 mW/cm^2 for controlled environments.

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

$$S = G\, P_T / 4\pi R^2 \tag{6}$$

Where:

- S = Power density (in appropriate units, e.g. mW/cm^2)
- G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
- P_T = 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:

$$G=10^{\wedge}(dB/10) \tag{7}$$

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

1.1.4.2. CR500 CELLULAR SIGNAL AMPLIFIER PARTICULARS

The following table shows the maximum downlink output power of the signal amplifier combined with an antenna with 9dBi gain. This is the maximum antenna gain permissible for the downlink signal as documented in the user/installation manual. The following table also shows the maximum uplink output power of the signal amplifier combined with an antenna with 18dBi gain. This is the maximum antenna gain permissible for the downlink signal as documented in the user/installation manual. The resulting radiated power density is compared to MPE limits for both uncontrolled and controlled environments.

1.1.4.3. UP LINK (1850-1910MHZ)

Uplink MPE Calculations

Output power of the amplifier:	0.224 W maximum
Antenna Gain: Maximum antenna gain allowed as described in user/installation manual.	Isotropic Gain = 9 dBi Numerical Gain = 7.94
Operational Frequency:	1850-1910 MHz
Minimum distance (Controlled): From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	20cm Antenna mounted in building interior
Minimum distance (Uncontrolled): From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	20cm Antenna mounted in building interior
Calculated RF Power Density:	0.354 mW/cm^2

Maximum Permissible Exposure (MPE):	**Controlled** 6 min avg exposure 6.17 mW/cm^2	**Uncontrolled** 30 min avg exposure 1.23 mW/ cm^2

1.1.4.4. TEST RESULTS:

Complies

1.1.4.5. CALCULATIONS

$$S = G\ P_T\ /\ 4\pi R^2 \tag{8}$$

S = (7.94* .224*10³)/(4π*20^2)

S = 1779/(1600π)

S = 0.354 mW/cm^2

1.1.4.6. DOWN LINK (869-894MHz)

Downlink MPE Calculations

Output power of the amplifier:	0.035 W maximum
Antenna Gain: Maximum antenna gain allowed as described in user/installation manual.	Isotropic Gain = 18 dBi Numerical Gain = 63.1
Operational Frequency:	1930-1990 MHz
Minimum distance (Controlled): From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	50cm Antenna mounted on building exterior
Minimum distance (Uncontrolled): 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 building exterior
Calculated RF Power Density:	0.071 mW/cm^2

Maximum Permissible Exposure (MPE):	**Controlled** 6 min avg exposure 6.44 mW/cm^2	**Uncontrolled** 30 min avg exposure 1.29 mW/ cm^2

1.1.4.7. TEST RESULTS:

Complies

1.1.4.8. CALCULATIONS

$$S = G\ P_T\ /\ 4\pi R^2 \qquad\qquad [9]$$

S = (63.1* .035*10³)/(4π*50^2)

S = 2209/(10000π)

S = 0.071 mW/cm^2