

Photo 3. Patch Antenna



Photo 4. Omni Antenna



Photo 5. Dipole Antenna



Photo 6. Parabolic Dish Antenna



Photo 7. Stub Antenna



Photo 8. Large Patch Antenna

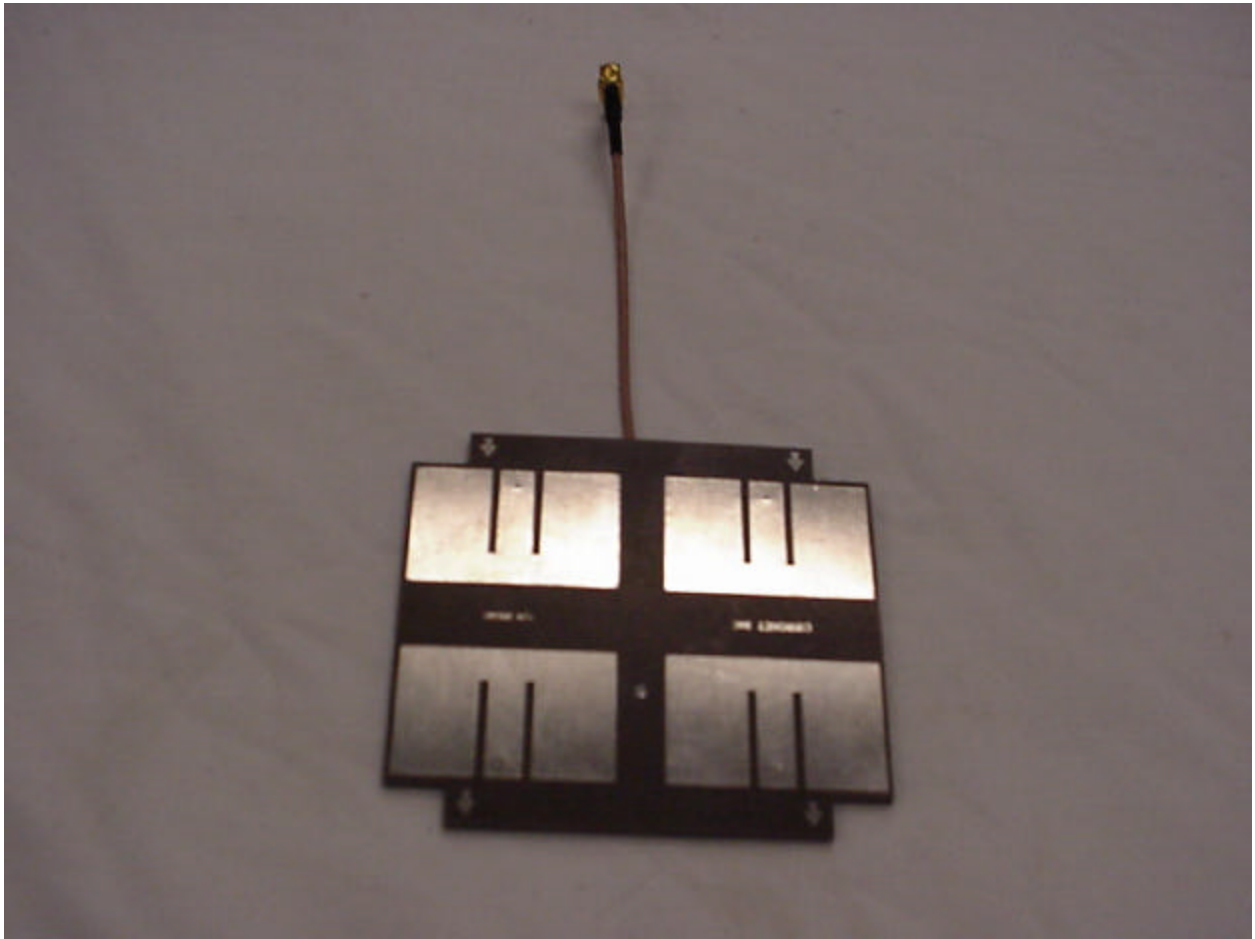
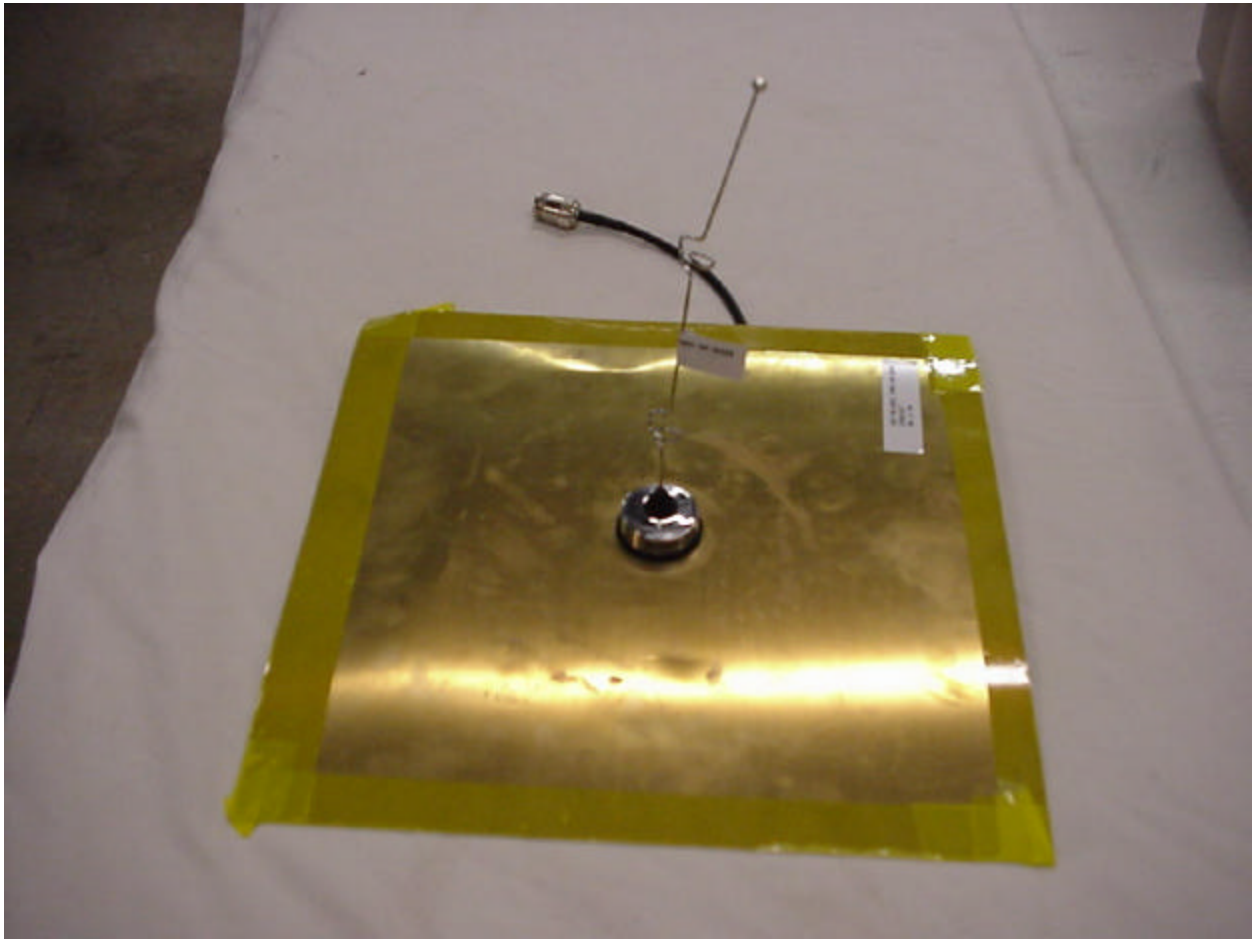


Photo 9. Whip Gold Plate Antenna



SECTION 4

USER'S MANUAL

The following statement will be placed in the front of the users manual:

Notice to users/installers using the 24 dBi parabolic dish antenna in conjunction with the WIT2410 module. *FCC rules limit the use of this antenna, when connected to the WIT2410 module, to point-to-point applications only. It is the responsibility of the installer to ensure that the system is prohibited from being used in point-to-multipoint applications, omnidirectional applications, and applications where there are multiple co-located intentional radiators transmitting the same information. Any other mode of operation using this antenna is forbidden.*

In order to meet FCC's MPE requirements, Cirronet Corporation will add the following statements to the users manual

Information to user/installer regarding FCC's Maximum Permissible Exposure (MPE) limits.

Notice to WIT2410 users/installers using the following fixed antennas:

*Hyperlink 24dBi parabolic dish,
Mobile Mark 14dBi Corner Reflector,
Cushcraft 15dBi Yagi*

The field strength radiated by any one of these antennas, when connected to a transmitting WIT2410 module, may exceed FCC mandated RF exposure limits. FCC rules require professional installation of these antennas in such a way that the general public will not be closer than 2 m from the radiating aperture of any of these antennas. End users of these systems must also be informed that RF exposure limits may be exceeded if personnel come closer than 2 m to the apertures of any of these antennas.

Notice to WIT2410 users/installers using the following mobile antennas:

*Mobile Mark 9dBi omnidirectional,
Cirronet 6dBi patch,
Ace 2dBi dipole,*

The field strength radiated by any one of these antennas, when connected to a transmitting WIT2410 module, may exceed FCC mandated RF exposure limits. FCC rules require professional installation of these antennas in such a way that the general public will not be closer than 20 cm from the radiating aperture of any of these antennas. End users of these systems must also be informed that RF exposure limits may be exceeded if personnel come closer than 20 cm to the apertures of any of these antennas.

SECTION 5

RF EXPOSURE INFORMATION

5.1 RF Safety Requirements to 2.1091 for Mobile Transmitters

The unit under evaluation has various external antennas. Cirronet Corporation calculated the MPE emission values for a WIT2410 with each of the antennas. The maximum power density occurs when using the 24 dBi dish for fixed applications and with the 12 dBi omnidirectional for mobile applications. They used the formula shown in OET Bulletin 65 and calculated the minimum distance between antenna and unsuspecting user as 26.0 cm for fixed applications and 2.0 cm for mobile applications.

Previously Approved Antennas

Cirronet Corporation will sell the WIT2410 with one of the following antennas.

MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB	TYPE OR CONNECTOR
ACE	Dipole	ACE-2400NF	2 dBi	Reverse SMA to MMCX via adapter cable
Cushcraft	Yagi	PC2415-RTNF	15 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Omni-Directional	OD6-2400-RNTC	6 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Corner Reflector	SCR14-2400PTA-RTNC	14 dBi	Reverse TNC to MMCX via adapter cable
Digital Wireless Corporation	Patch	PA2400	Appx. 3 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Vehicle Mount Stub	RM3-2400-RTNC	2.5 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Corner Reflector	SCR9-2400-RN	9 dBi	Reverse N to MMCX via adapter cable
MaxRad	Whip	MUF24005.RTNC	5 dBi	Reverse TNC to MMCX via adapter cable
Andrews	Parabolic Dish	26T-2400A	24 dBi	Reverse N to MMCX via adapter cable
Hyperlink Technologies, Inc.	Parabolic Dish	2424GC	24 dBi	Reverse N to MMCX via adapter cable
Andrews	Parabolic Dish	18T-2400 A	18 dBi	Reverse N to MMCX via adapter cable
MaxRad	Whip Magnetic Mount (Mobile Vehicle Whip)	MUF24005.RTNC	5 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Omni	OD9-2400MUF24005	9 dBi	Reverse TNC to MMCX via adapter cable
Cirronet Corporation	Patch	GA Tech	12 dBi	Non-standard MMCX
Cirronet Corporation	Patch	PA2410	6dBi	Non-standard MMCX

5.1 RF Safety Requirements to 2.1091 for Mobile Transmitters – Cont.

Power Output

The EUT's maximum expected output power as shown in the original grant of certification (FCC ID: HSW-2410M) was

Frequency of Fundamental (MHz)	Measurement (dBm)*	Measurement (Watt)*	FCC Limit* (Watt)
2401.7	15.29	0.034	1.0
2435.7	16.19	0.042	1.0
2469.8	16.49	0.046	1.0

* Measurement includes 0.3 dB for cable loss

The maximum EIRP expected for fixed installations is with the +24 dBi gain parabolic dish antenna. This would yield and maximum EIRP of 16.5 dBm + 24 dBi = +40.5 dBm.

The maximum EIRP expected for mobile installations is with the +12 dBi gain omnidirectional antenna. This would yield and maximum EIRP of 16.5 dBm + 12 dBi = +28.5 dBm.

5.1 RF Safety Requirements to 2.1091 for Mobile Transmitters – Cont.

Source Based Time Averaging

Additionally, source based time averaging may be applied as the worse case transmit duty cycle is given as follows:

Worst Case Transmit Duty Cycle for WIT2410

This factor was calculated by first determining the worst case scenario for system operation - worst case being defined as the scenario when the WIT2410 would be transmitting the longest period during a dwell.

This worst case operating scenario is as follows:

- 1) point-to-point operation
(only two units communicating with one another)
- 2) data flow is almost completely unidirectional
(that is, one radio is relaying a large amount of data to the other radio with only synchronization data being passed back the other direction)
- 3) The amount of data being fed to the sending radio is exactly portioned out to fit the maximum packet size allowable (280 bytes). The radio cannot send more than 280 bytes on a single channel – additional data must be sent on the next hop.

For this example, a remote unit is transferring a large data file to a base unit. The maximum transmit time by Remote on a single channel would be:

$$= 280 \text{ bytes} * 8 \text{ bits/byte} * (1/460.8 \text{ Kbps}) = 4.86 \text{ ms}$$

The minimum hop duration for this scenario would be 6.94 ms. This transmit pattern would continue on each channel and is considered repetitive. Therefore, for purposes of MPE, the transmission duty cycle correction factor is then calculated as:

$$\text{Duty cycle} = (\text{on time})/(\text{total time}) = 4.86/6.94 = 70.0 \%$$

This yields for a duty cycle correction of $10 \log (0.70) = -1.5 \text{ dB}$. Therefore the maximum EIRP for fixed installations may be expected to be

$$+40.5 \text{ dBm} - 1.5 \text{ dB} = +39.0 \text{ dBm}$$

$$\text{Antilog}(39.0 \text{ dBm}/10) = 7943.3 \text{ mW}$$

The maximum EIRP for mobile installations may be expected to be

$$+28.5 \text{ dBm} - 1.5 \text{ dB} = +27.0 \text{ dBm}$$

$$\text{Antilog}(27.0 \text{ dBm}/10) = 501.2 \text{ mW}$$

5.1 RF Safety Requirements to 2.1091 for Mobile Transmitters – Cont.

MPE Calculations

The limits for this unit (uncontrolled exposure) are 1.0 mW/cm^2 . Taking the RF Density Field Equation:

Fixed Installations

$S = (\text{EIRP in mW}) / (4\pi R^2)$ and solving for Distance R

$$S = 7943.3 / 4\pi 20^2$$

$$S = 7943.3 / 5026.55$$

$$S = 1.6 \text{ mW/cm}^2$$

And

Mobile Installations

$$S = 501.2 / 4\pi 20^2$$

$$S = 501.2 / 5026.55$$

$$S = .1 \text{ mW/cm}^2$$

$$R = \text{SQRT} ((\text{EIRP in mW}) / (S4\pi))$$

Solving the above equation yields

$$R (\text{cm}) = \text{SQRT} (7943.3(\text{mW}) / (1.0(\text{mW/cm}^2) * 4 * \pi)) = 26.0 \text{ cm for fixed installations}$$

All manual instructions will specify 20 cm for mobile installations and 26 cm minimum up to 2 meters for fixed installations.