# Modular Portable Antenna System (MPAS) Lite Operator's Manual

Nevada - USA

WWW.CHAMELEONANTENNA.COM

***VERSATILE – DEPENDABLE – STEALTH – BUILT TO LAST***

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# Table of Contents



WARNING! Never mount this, or any other antenna near power lines or utility wires! Any materials: ladders, ropes, or feedlines that contact power lines can conduct voltages that kill. Never trust insulation to protect you. Stay away from all power lines.

WARNING! Never operate this antenna where people could be subjected to high levels of RF exposure, especially above 10 watts or above 14 MHz. Never use this antenna near RF sensitive medical devices, such as pacemakers.

# Introduction

Thank you for purchasing and using the Chameleon Antenna™ High Frequency (HF) Modular Portable Antenna System Lite (CHA MPAS LITE). The CHA MPAS LITE is designed to be the most versatile, high performance, and rugged portable / man-packable HF antenna available using the "LEGO® BLOCK" approach, as described by Survival Tech Nord. The MPAS is a concept that allows the radio operator to configure and deploy the antenna system in a variety of configurations. The MPAS LITE version offers basic MPAS capability at a lower price for those operators that don't need the full capability of the military-style MPAS 2.0. The Chameleon Antenna™ MPAS series is the most popular modular portable HF antenna system in the world!

The core components of the antenna system, see plate (1), are: a CHA HYBRID-MICRO matching unit and antenna base, 60 feet of antenna/counterpoise wire, a 17-foot telescoping stainless steel whip (CHA SS17), an in-ground antenna mount (CHA SPIKE MOUNT), and a coaxial cable with an integrated Radio Frequency Interference (RFI) choke. Available high-performance options *(sold separately)* include a counterpoise (radial) kit (CHA COUNTERPOISE KIT), a versatile clamp-on antenna mount (CHA JAW MOUNT), and a heavy-duty clamp-on antenna mount (CHA UCM). The components of the CHA MPAS LITE provide a continuum of portability and performance to meet your communications requirements.

**Plate 1. CHA MPAS LITE Components.**

The integral broadband impedance matching network transformer of the CHA HYBRID MICRO allows broadband antenna tuning. The antenna will operate continuously from 1.8 – 54.0 MHz (including 160m – 6m amateur bands) without any adjustment with a wide range antenna tuner or coupler (when using the telescoping whip, the performance is limited below 3.5 MHz). The CHA MPAS LITE is perfect for Government, Non-Governmental Organizations (NGO), and Emergency Preparedness and Survival Communication. It is also the antenna for hams that enjoy camping, hiking, biking or other types of outdoor recreation which require communication gear to be both effective and highly portable. The CHA MPAS LITE is configurable to facilitate Near-Vertical Incident Sky wave (NVIS) communication and is water resistant *(equivalent to IPX-6)*. The CHA MPAS LITE requires a wide range antenna tuner or coupler on some bands and frequencies. Antennas built by Chameleon Antenna™ are versatile, dependable, stealthy, and built to last. Please read this operator's manual so that you may maximize the utility you obtain from your CHA MPAS LITE.

# HF Propagation

HF radio provides relatively inexpensive and reliable local, regional, national, and international voice and data communication capability. It is especially suitable for undeveloped areas where normal telecommunications are not available, too costly or scarce, or where the commercial telecommunications infrastructure has been damaged by a natural disaster or military conflict.

Although HF radio is a reasonably reliable method of communication, HF radio waves propagate through a complex and constantly changing environment and are affected by weather, terrain, latitude, time of day, season, and the 11-year solar cycle. A detailed explanation of the theory of HF radio wave propagation is beyond the scope of this

operator's manual, but an understanding of the basic principles will help the operator decide what frequency and which of the EMCOMM III Portable's configurations will support their communication requirements.

HF radio waves propagate from the transmitting antenna to the receiving antenna using two methods: ground waves and sky waves.

Ground waves are composed of direct waves and surface waves. Direct waves travel directly from the transmitting antenna to the receiving antenna when they are within the radio line-of-sight. Typically, this distance is 8 to 14 miles for field stations. Surface waves follow the curvature of the Earth beyond the radio horizon. They are usable, during the day and under optimal conditions, up to around 90 miles, see table (1).

Low power, horizontal antenna polarization, rugged or urban terrain, dense foliage, or dry soil conditions can reduce the range very significantly. The U.S. Army found that in the dense jungles of Vietnam, the range for ground waves was sometimes less than one mile.

Sky waves are the primary method of HF radio wave propagation. HF radio waves on a frequency below the critical frequency (found by an ionosonde) are reflected off one of the layers of the ionosphere and back to Earth between 300 and 2,500 miles, depending upon the frequency and ionospheric conditions.

| Frequency | Distance | Frequency | Distance |
|---|---|---|---|
| **2 MHz** | 88 miles | **14 MHz** | 33 miles |
| **4 MHz** | 62 miles | **18MHz** | 29 miles |
| **7 MHz** | 47 miles | **24 MHz** | 25 miles |
| **10 MHz** | 39 miles | **30 MHz** | 23 miles |

**Table 1. Maximum Surface Wave Range by Frequency.**

HF radio waves can then be reflected from the Earth to the ionosphere again during multi-hop propagation for longer range communication. The most important thing for the operator to understand about HF radio wave propagation is the concept of Maximum Usable Frequency (MUF), Lowest Usable Frequency (LUF), and Optimal Working Frequency (OWF). The MUF is the frequency for which successful communications between two points is predicted on 50% of the days of in a month. The LUF is the frequency below which successful communications are lost due to ionospheric loses. The OWF, which is somewhere between the LUF and around 80% of the MUF, is the range of frequencies which can be used for reliable communication. If the LUF is above the MUF, HF sky wave propagation is unlikely to occur.

The HF part of the Radio Frequency (RF) spectrum is usually filled with communications activity and an experienced operator can often determine where the MUF is, and with less certainty, the LUF by listening to where activity ends. The operator can then pick a frequency in the OWF and attempt to establish contact. Another method is using HF propagation prediction software, such as the *Voice of America Coverage Analysis Program (VOACAP)*, which is available at no cost to download or use online at www.voacap.com. The operator enters the location of the two stations and the program show a wheel with the predicted percentage of success based on frequency and time. ALE, which is the standard for interoperable HF communications, is an automated method of finding a frequency in the OWF and establishing and maintaining a communications link.

Even under optimal conditions, there is a gap between where ground waves end (around 40 to 90 miles) and the sky wave returns to Earth on the first hop (around 300 miles). NVIS propagation can be used to fill this gap. The frequency selected must be below the critical frequency, so NVIS is can normally only be used on frequencies from around 2 to 10 MHz. Frequencies of 2 – 4 MHz are typical at night and 4 – 8 MHz during the day.

## Parts of the Antenna

The CHA MPAS LITE antenna is comprised of the following components, see plate (2):

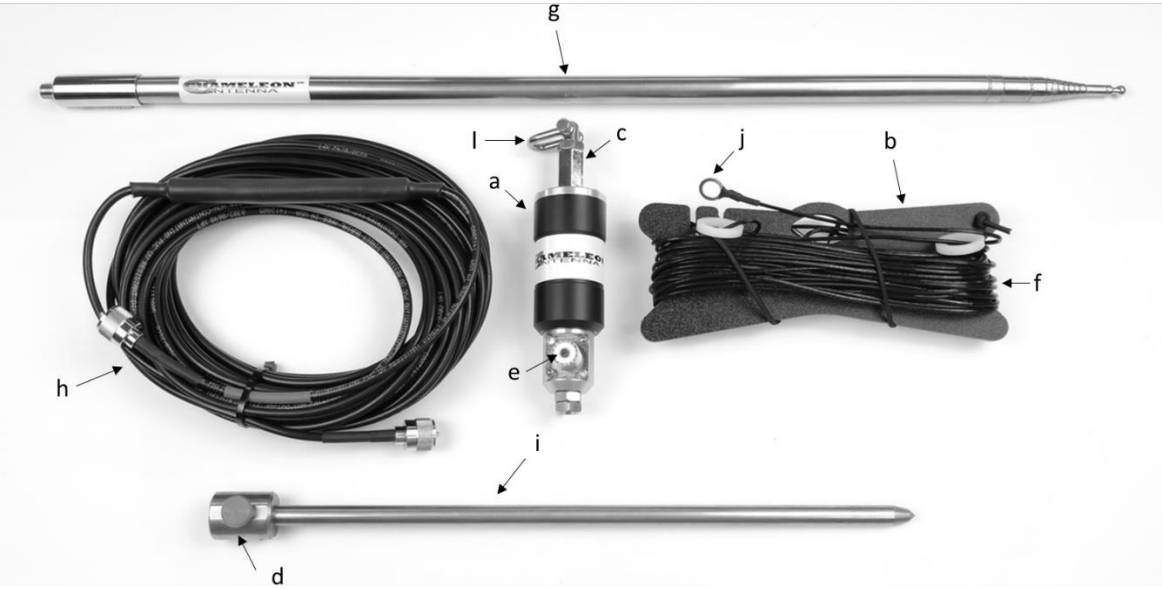



**Plate 2. CHA MPAS LITE Components.**

a. **Matching Transformer.** The Matching Transformer is a CHA HYBRID MICRO and provides impedance matching for the CHA MPAS LITE antenna.

b. **Line Winder.** The Line Winder is used to store the Antenna/Counterpoise Wire and enables rapid deployment and recovery of the antenna.

**c. Antenna Socket.** The Antenna Socket is a 3/8" x 24 threaded socket on the top of the Matching Transformer and is used to attach the Telescoping Whip or Antenna Wire.

d. **Counterpoise Connection.** The Counterpoise Connection is the red knurled knob, on the side of the Spike Mount, used to connect the Counterpoise Wire**.**

e. **UHF Socket.** The UHF Socket, SO-239, is located on the side of the Matching Transformer and is used to connect the Coaxial Cable.

f. **Antenna/Counterpoise Wire**. The Antenna/Counterpoise Wire consist of a 60-foot length of insulated wire wrapped around the Line Winder. It is used as Antenna Wire in the End Fed Inverted "V" configuration and as a Counterpoise Wire in the Telescoping Vertical configuration.

g. **Telescoping Whip.** The Telescoping Whip is a telescoping stainless-steel radiator. It extends to 17 feet and collapses to 24 inches.

h. **Coaxial Cable.** The Coaxial Cable is the feedline that connects to the UHF Socket at one end and the Radio Set at the other.

i. **Spike Mount.** The Spike Mount provides the ground mounted base for the antenna.

j. **Terminal Lug.** The Terminal Lug is located at one end of the Antenna/Counterpoise Wire and used to connect to the Matching Transformer or Spike Mount.

k. **Insulator Rings.** There are three Insulator Rings, one at each end of the Antenna Wire and one floating in the center. They are used to mechanically connect and electrically isolate the Antenna Wire.

l. **Shackle.** The Shackle is used to mechanically and electrically attach the Antenna Wire to the Matching Transformer.

m. **Carabiner.** The Carabiner is used to mechanically connect the Antenna Wire to the Matching Transformer for strain Relief.

## Antenna Configurations

Using the supplied components, the Chameleon Antenna™ CHA MPAS LITE antenna can be deployed into two useful configurations. They are described in this manual and each has unique operational performance characteristics. Table (2) can assist the operator to quickly select the most appropriate antenna configuration to meet their operational requirements.

| Configuration | Ground | Short | Medium | Long | Directionality |
|---|---|---|---|---|---|
| **End Fed Inverted "V"** | | ↓ | ↕ | | Bi-directional |
| **Telescoping Vertical** | ↕ | | ↕ | | Omni-directional |

**Table 2. Antenna Configuration Selection.**

To use the table, decide which distance column (Ground = 0 to 90 miles, Short = 0 - 300 miles, Medium = 300 – 1500 miles, Long > 1500 miles) best matches the distance to the station with whom you need to communicate. Then, determine if the OWF is in the lower (↓ = 1.8 – 10 MHz) or upper (↑ = 10 – 30 MHz) frequency range. Finally, select the CHA MPAS LITE configuration with the corresponding symbol in the appropriate distance column. Both CHA MPAS LITE configurations provide some capability in each distance category, so depending upon the complexity of your communications network, you may need to select the best overall configuration. The directionality column indicates the directionality characteristic of the antenna configuration. When using NVIS, all the configurations are omnidirectional.

### End Fed Inverted "V" Configuration

The CHA MPAS LITE, End Fed Inverted "V" configuration, see figure (1), is a short to medium range HF antenna. It can provide good medium range communication on all HF frequencies and acceptable NVIS propagation below 10 MHz. This configuration is bi-directional broadside to the antenna above 10 MHz and omni-directional below 10 MHz. Improved performance can be obtained using at least one counterpoise from the optional Counterpoise Kit. Perform the following steps to deploy the End Fed Inverted "V" configuration.

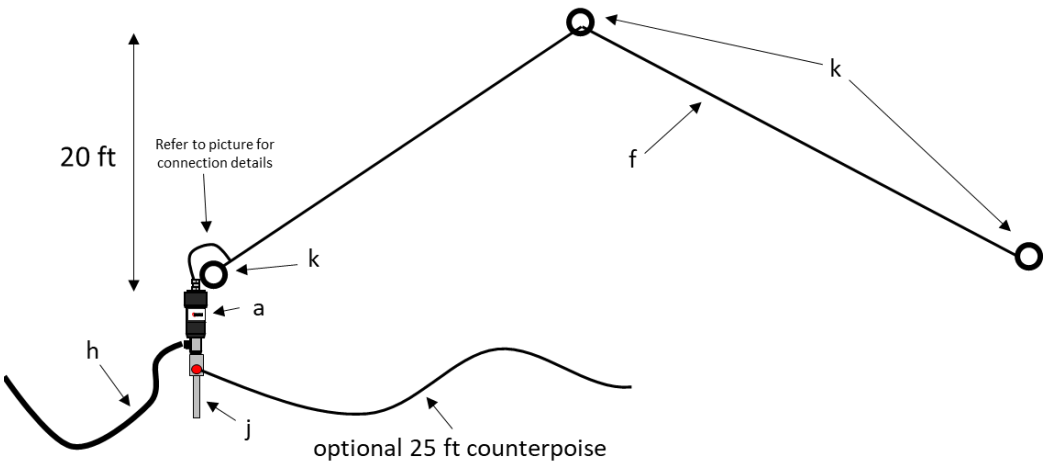



**Figure 1. End Fed Inverted "V" Configuration.**

1. Select a site to deploy the CHA MPAS LITE End Fed Inverted "V" configuration. The best site would be a mostly clear area, around 45 feet in length with a 20-foot tall support (such as a portable mast or tree) in the center.
2. Unwind the Antenna Wire (f) from the Line Winder (b) and position the floating Insulator Ring (k) approximately in the center of the Antenna Wire.
3. Using a Bowline or similar knot, tie the support line coming from the top of the center support to the floating Insulator Ring.
4. Using the support line, haul the center of the Antenna Wire to the top of the center support. *The center of the Antenna Wire should be no higher than around 20 feet to form the correct angle of the Inverted "V".*
5. Pace off around 22 feet from the center support and drive the Spike Mount (i) half way (approximately eight inches) into the ground. Use a plastic or rubber tent mallet to avoid damaging the face of the Spike Mount.
6. Thread the stud at the base of the Matching Transformer (a) into the socket on top of the Spike Mount. Tighten by hand until snug.
7. Place the Terminal Lug (j) at the end of the Antenna Wire over the Antenna Socket (c) on top of the Matching Transformer and then thread the Shackle (l) stud through the Terminal Lug and into the Antenna Socket. Tighten nut.
8. Attach a Carabiner (m) to the Insulator Ring at the Terminal Lug end of the Antenna Wire.
9. Attach the Carabiner to the Shackle bow. Ensure the Shackle pin is tight. *The assembly should look like that pictured in plate (3).*

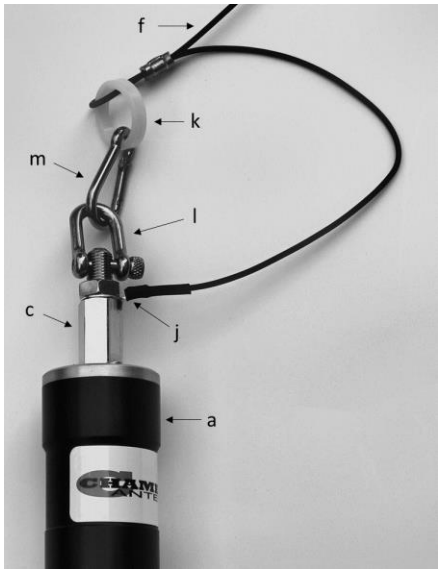



**Plate 3. Antenna Wire Connections.**

10. Attach a short length (around 5 feet) of Paracord to the Insulating Ring at the far end of the Antenna Wire using a Bowline or similar knot.
11. Pull the far end of the Antenna Wire to near the location where it will be attached to the ground.
12. Drive a Tent Stake (not supplied) into the ground around three feet beyond the end of the Antenna Wire.

13. Pull the Antenna Wire tight, but not taut, and secure the Paracord to the Tent Stake using a round turn and two half hitches or similar knot.
14. Connect the Coaxial Cable (h) to the UHF Socket (e) on the Matching Transformer.
15. Connect the Coaxial Cable to the Radio Set.
16. Perform operational test.

## Telescoping Vertical Configuration

The CHA MPAS LITE, Telescoping Vertical configuration, see figure (2), is an omnidirectional short to medium range HF antenna. It will provide good overall performance using skywave and ground wave propagation. This configuration is extremely quick and easy to setup. Improved performance can be obtained using the optional Counterpoise Kit; which will create an efficient ground-plane for the vertical antenna. Perform the following steps to deploy the Telescoping Vertical configuration.

1. Drive the Spike Mount (j) half way (approximately eight inches) into the ground in the center of the selected site. Use a plastic or rubber tent mallet to avoid damaging the face of the Spike Mount.
2. Thread the base stud on the bottom of the Matching Transformer (a) into the socket on top of the Spike Mount. Tighten by hand.
3. Thread the stud at the base of the Telescoping Whip (g) into the Antenna Socket (c) on top of the Matching Transformer. Tighten by hand.
4. Starting at the top, carefully extend the Telescoping Whip (g), one section at a time, until it is fully extended.

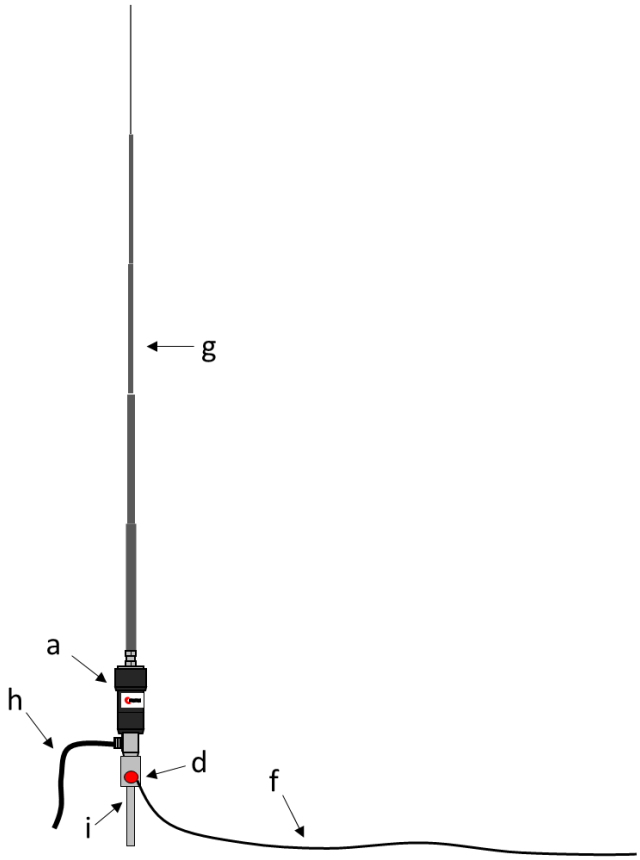



**Figure 2. Telescoping Vertical Configuration.**

5. Connect the Terminal Lug (j) at the end of the Counterpoise Wire (f) to the Counterpoise Connection (d) on the Spike Mount.

*The antenna base should look like that pictured in plate (4).*

6. Unwind around 25 feet of the Counterpoise Wire from the Line Winder (b).
7. Extend the Counterpoise Wire in any convenient direction. Lay the Line Winder with unwound Counterpoise Wire on the ground.
8. Connect the Coaxial Cable Assembly (k) to the UHF Socket (e) on the Matching Transformer.
9. Connect the Coaxial Cable to the Radio Set.
10. Perform operational test.

The length of the Telescoping Whip length can be optimized when used on the higher bands for no-tuner operation, as shown in Table (2). Use a 25 ft Counterpoise Wire.

**Plate 4. Telescoping Vertical Base.**

| Band | Whip Length (ft) | Whip Sections | SWR |
|---|---|---|---|
| 30 | 17 | All Sections Extended | 1.9:1 |
| 20 | 17 | All Sections Extended | 1.5:1 |
| 17 | 17 | All Sections Extended | 1.3:1 |
| 15 | 12 | Top Three Sections Down | 1.4:1 |
| 12 | 12 | Top Three Sections Down | 1.1:1 |
| 10 | 12 | Top Three Sections Down | 1.2:1 |
| 6 | 5 | Only Bottom Three Sections Extended | 1.3:1 |

**Table 2. Higher Band Optimization.**

## Recovery Procedure

To recover the CHA MPAS LITE antenna, perform the following steps:

1. Disconnect the Coaxial Cable from the radio set.
2. Disconnect the Coaxial Cable from the Matching Transformer.
3. Carefully roll (do not twist) the Coaxial Cable. Secure the rolled cable with a sticky strap and set aside.
4. If used, detach the Telescoping Whip and starting from the bottom, collapse one section at a time until the Telescoping Whip is completely collapsed.
5. Disconnect the Antenna/Counterpose Wire.
6. Wind the Antenna/Counterpoise Wire onto the Line Winder and secure with attached shock cord.
7. Detach the Matching Transformer.
8. Pull the Spike Mount out of the ground.

9. Remove dirt from antenna components and inspect them for signs of wear.
10. Store components together ready for next antenna deployment.

## Troubleshooting

1. Inspect the Antenna/Counterpoise Wire for breakage or signs of strain.
2. Inspect the Telescoping Whip for breakage.
3. Ensure UHF Plug from the Coaxial Cable Assembly is securely connected to the UHF Socket of the Matching Transformer and Radio Set.
4. Inspect Coaxial Cable Assembly for cuts in insulation or exposed shielding.
5. If still not operational, replace Coaxial Cable Assembly. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
6. If still not operational, contact Chameleon Antenna™ at support@chameleonantenna.com for technical support, be sure to include details on the antenna configuration, symptoms of the problem, and what steps you have taken.

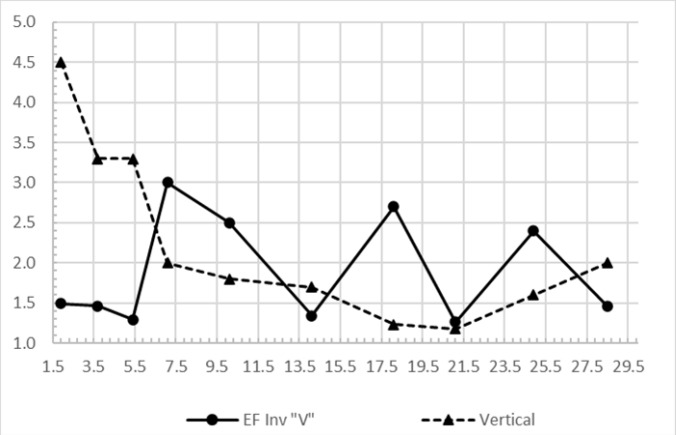
## Accessories

The following accessories are available for purchase from Chameleon Antenna™. Please contact us at support@chameleonantenna.com for current prices and availability.

- **Counterpoise Kit.** The Counterpoise Kit is ideal for portable antenna deployment. The system will create an efficient ground-plane or counterpoise for the both CHA MPAS LITE configurations. It contains four 25-foot wire radials secured around plastic wire winders and four steel Tent Stakes.
- **CHA JAW Mount.** The Chameleon Jaw Mount has been assembled to offer portable antenna versatility for Chameleon Antenna owners. The mount orientation can easily be changed with a simple 3/16 Allen Key.
- **CHA UCM**. The Super heavy-duty CHA UCM Universal Clamp Mount, is the first ham radio antenna mounting system, purposely designed for extreme portable operations. This is a rugged, robust product, intended to support considerable antenna loads.

## Specifications

- Frequency: Amateur Radio Service bands 1.8 MHz through 54.0 MHz (160 - 6m). Performance is limited below 3.5 MHz when using the telescoping whip.
- Power: 100 W SSB voice. 25W All Other Modes Intermittent Commercial and Amateur Service (ICAS). Note: Prolonged transmissions or exceeding power specification may damage antenna components.
- SWR: Subject to frequency and configuration. Typically, less than 3.0:1, except as noted in figure (3). An antenna tuner or coupler will be required for operation on some Amateur Radio Service Bands.
- Length: 17 ft (telescoping whip), 60 ft (wire).
- Weight: Approximately 4 lbs.
- Water Resistance: Equivalent to IPX-6 *(not laboratory tested).*
- Personnel Requirements and Setup Time: one operator, approximately 5 minutes
- Far Field plots for the CHA MPAS LITE antenna configurations are shown in figures (4) through (7).




| SWR | EF Inv "V" | Vertical |
|---|---|---|
| 1.9 | 1.5 | 4.5 |
| 3.7 | 1.5 | 3.3 |
| 5.4 | 1.3 | 3.3 |
| 7.1 | 3.0 | 2.0 |
| 10.1 | 2.5 | 1.8 |
| 14.1 | 1.3 | 1.7 |
| 18.1 | 2.7 | 1.2 |
| 21.1 | 1.3 | 1.2 |
| 24.9 | 2.4 | 1.6 |
| 28.5 | 1.5 | 2.0 |

**Figure 3. Typical CHA MPAS LITE Measured SWR.**

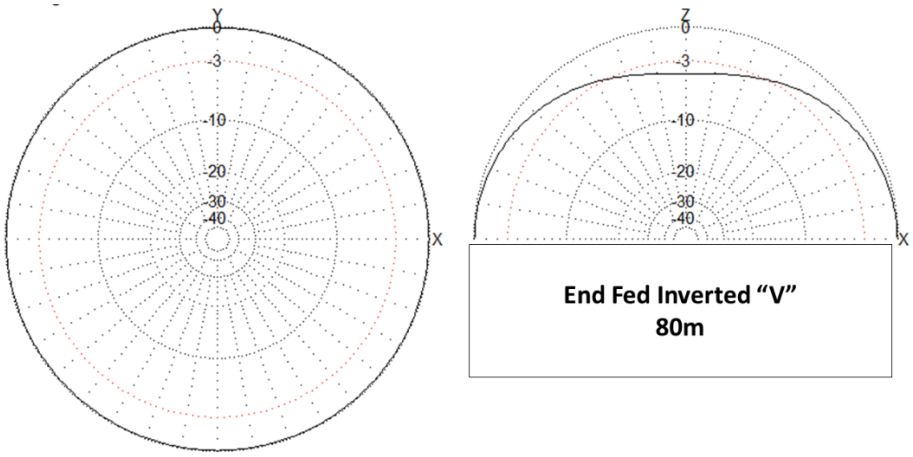



**Figure 4. End Fed Inverted "V" Far 80m Field Plot.**

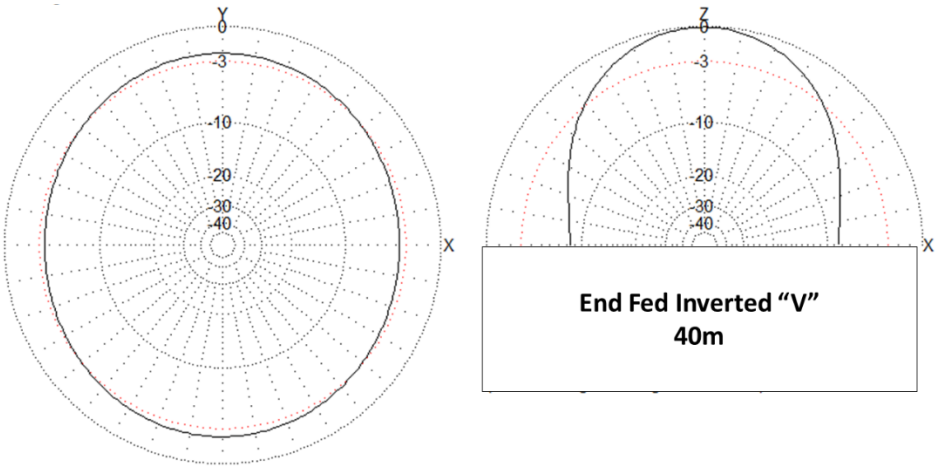



**Figure 5. End Fed Inverted "V" 40m Far Field Plot.**

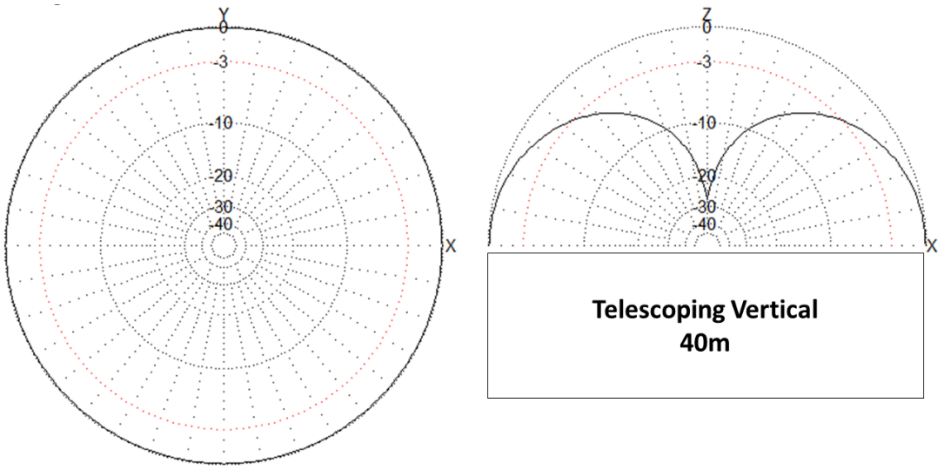



**Figure 6. Telescoping Vertical 40m Far Field Plot.**

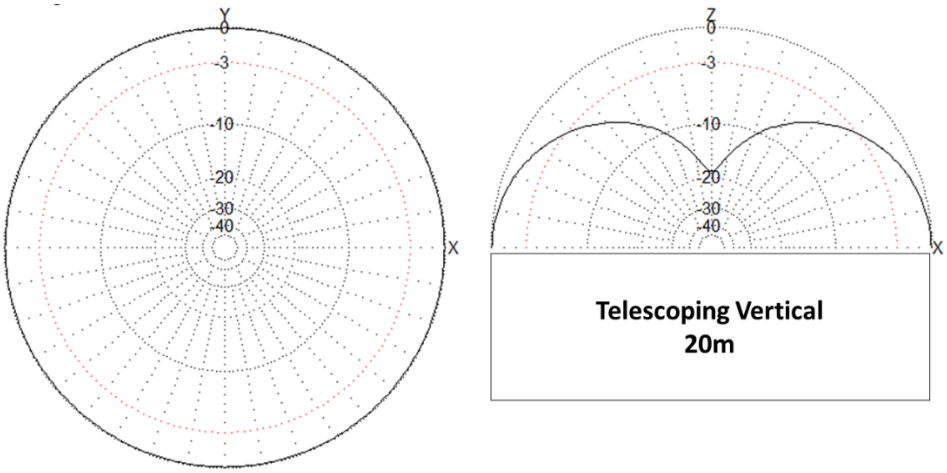


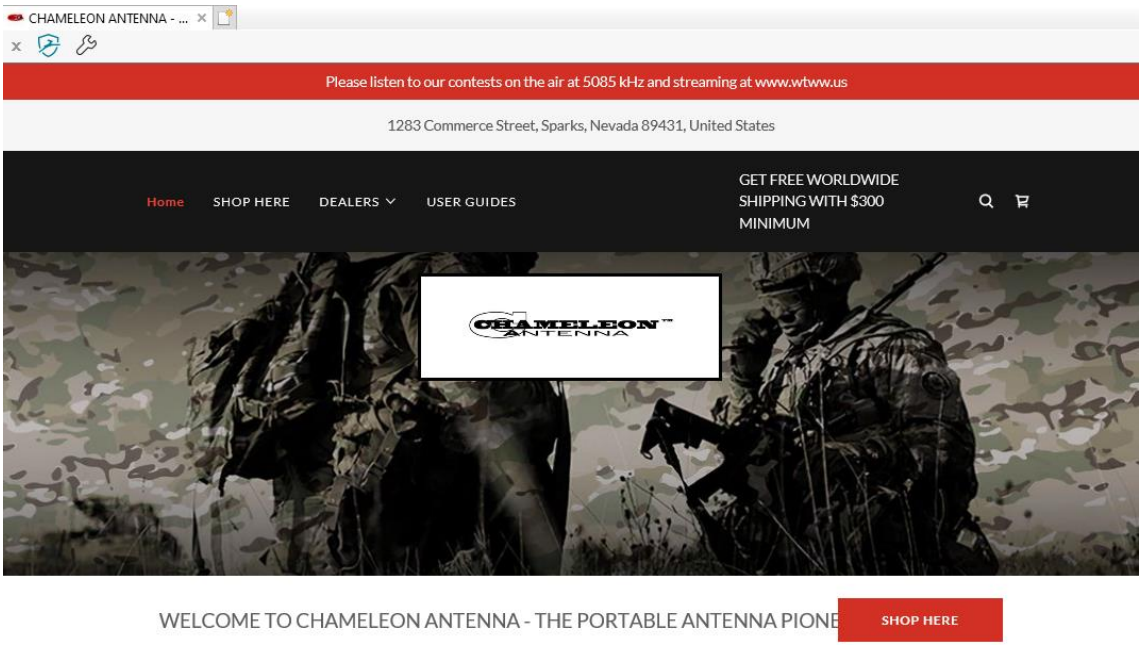

**Figure 7. Telescoping Vertical 20m Far Field Plot.**

## Warranty

Chameleon Antenna™ warrants this antenna to be free from defects in materials and workmanship for a period of 12 months from the date of purchase. To obtain warranty service, return all components of the system to Chameleon Antenna at your expense. Chameleon Antenna will repair or replace defective components and return the system to you at no charge. We encourage you to call us for technical support before returning the antenna. This warranty excludes components that have been damaged or modified by the customer.

## Chameleon Antenna™ Products

Please go to http://chameleonantenna.com for information about additional quality antenna products available for purchase from Chameleon Antenna™ – The Portable Antenna Pioneer.

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3. Turkes, Gurkan, 1990, *Tactical HF Field Expedient Antenna Performance Volume I Thesis*, U.S. Naval Post Graduate School, Monterey, CA.