HF Portable Loop Antenna
(CHA P-LOOP)
Operator's Manual

California - USA
WWW.CHAMELEONANTENNA.COM

VERSATILE – DEPENDABLE – STEALTH – BUILT TO LAST

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.

WARNING! A tuned loop can exhibit several hundred Volts and concentrated electromagnetic radiation when operating at QRP power levels (5-10 W). At higher RF levels, several thousand volts will be present at resonance! Exercise caution when using this antenna. Operate this antenna at your own risk.

Introduction

Thank you for purchasing and using the Chameleon Antenna™ High Frequency (HF) Portable Loop Antenna (CHA P-LOOP). This is an exciting new product from Chameleon Antenna™ and you are now part of the magnetic loop HF antenna craze that is sweeping the amateur radio community. Easily deployable HF magnetic loop antennas, also called small transmitting loops, have been routinely used for many years in military, diplomatic, and shipboard HF communication links, where robust and reliable general coverage radio communication is a necessity. These antennas have only recently become commercially available for amateur radio. You will be amazed by the performance of this antenna. The real practical advantage of the small loop, compared to a short vertical whip tuned against earth or a full sized vertical antenna, is the loop's freedom from dependence on a ground plane and earth for achieving efficient operation; this unique characteristic has profound significance for portable or restricted space antennas. In comparison, the bottom of a vertically oriented loop does not need to be more than a loop diameter above ground making it very easy to site in a restricted space location. There is no significant improvement in performance when a small loop is raised to great heights; all that matters is the loop is substantially clear of objects in the immediate area and oriented towards the desired direction of radiation. The magnetic loop is different than typical antennas because it emphasizes the magnetic part of the radio wave (H field) rather than the electric part (E field) of the radio wave. It also has a high Q resonance of around 15 KHz on 40 meters, providing immunity from interference outside the bandpass.

Field trials of the CHA P-LOOP demonstrated that an inside magnetic loop antenna was only around one to two S-units lower, on both transmit and receive, than an outside full-size dipole antenna. The CHA P-LOOP was also compared to a popular portable vertical antenna. Signal strengths were about the same for both antennas, but the CHA-PLOOP had much less man-made noise – a known advantage of magnetic loop antennas. The CHA P-LOOP was also much faster and easier to setup and tune since it didn't need a quarter wave counterpoise wire or use finicky coil taps. Remarkable for an antenna that is less than three foot in diameter and covers 6.0 MHz to 29.7 MHz (40 – 10 meter ham bands)!

The CHA P-LOOP Antenna was designed to be rugged, portable, and versatile. It is ideal when you require highly portable communication capability - such as when hiking, camping, staying in a hotel, preparing for emergencies or disasters, and other activities and places that preclude erecting a full-size wire or vertical antenna. The CHA P-LOOP has several notable quality design features. First, there is minimal body induction while tuning the loop. The SWR will remain stable while holding and tuning the loop.

The proprietary design of the coupling loop is rigid and does not have solder joints. It is skillfully machined and everything is held mechanically with a standard 3/8-24 large nut. The rigid coupling loop maintains its symmetry, thus ensuring the same easy and efficient tuning. It also remains in the same plane as the radiating loop, which maximizes radio frequency radiation and performance.

The CHA P-LOOP, see plate (1), is comprised of a 33¾ inch diameter flexible radiator loop, a rigid coupling loop, a telescoping mast with handle and tripod

Plate 1. Complete CHA P-LOOP Antenna.

mount, a specially designed tuning unit, and coaxial feed line – all of which fit in the supplied Khaki colored classic military-style messenger bag.

The CHA P-LOOP doesn't require a ground-plane and doesn't need to be mounted up high. Do not use an antenna tuner or coupler, as it may cause you to mistune the antenna.
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 P-LOOP antenna.

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 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.

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.

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. HF radio waves can then be reflected from the Earth to the ionosphere again during multihop 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.

A magnetic loop antenna radiates at all angles from horizon to zenith, making it an equally effective antenna for both local and long-distance (DX) communication. While not specifically designed for NVIS, during field testing of the CHA P-LOOP, several NVIS contacts were made on the 40 meter ham band during the day.

Parts of the Antenna

The CHA P-LOOP is comprised of the following components, see plate (2):

a. Tuning Unit

The Tuning Unit adjusts the resonant frequency of the CHA P-LOOP antenna.

b. Flexible Radiator Loop

The Flexible Radiator Loop consists of a 33¾ inch diameter insulated flexible metal loop with UHF Plugs (PL-259) at both ends.

c. Coupling Loop

The Coupling Loop is a small aluminum loop attached to the end of the Telescoping Mast (d).

d. Telescoping Mast

The Telescoping Mast connects the Tuning Unit (a) to the Coupling Loop (c).

e. Telescoping Mast Clamps

The three Telescoping Mast Clamps are located along the Telescoping Mast (d) and are used to adjust its length.

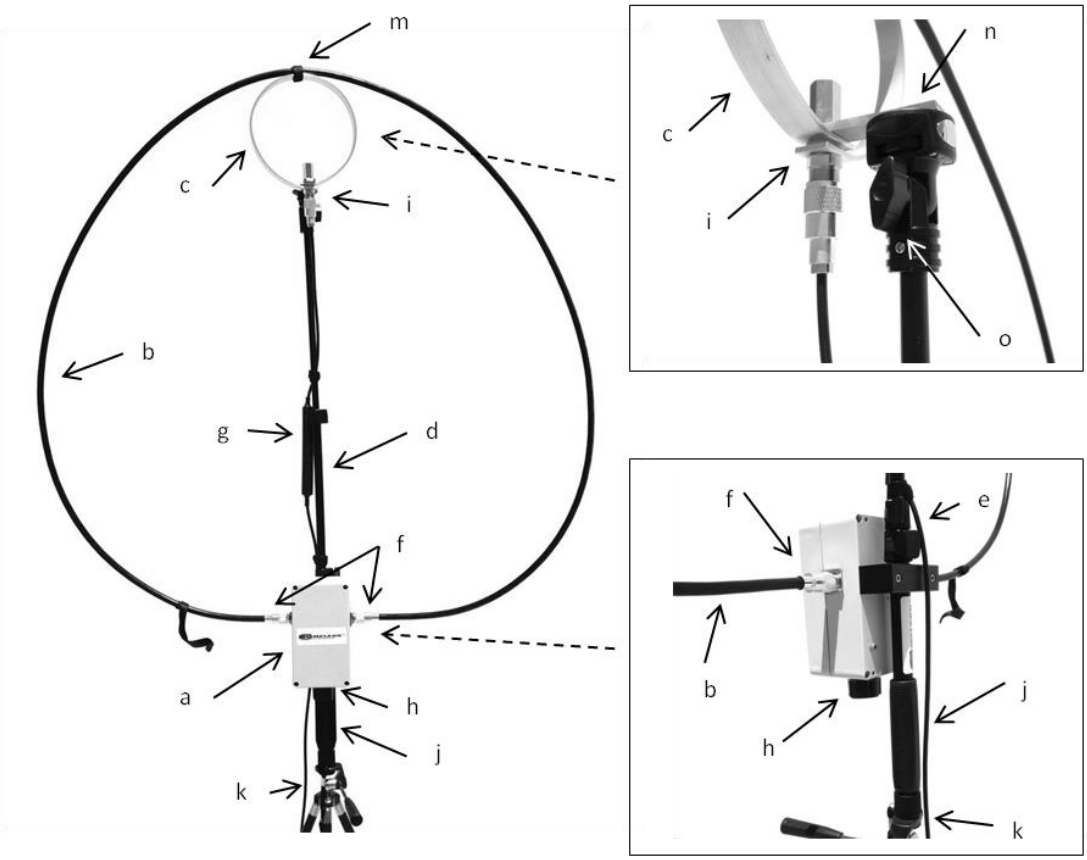

Plate 2. Portable Loop Antenna.

f. Flexible Radiator Loop Connections

The Flexible Radiator Loop Connections are UHF sockets (SO-239) located on the right and left sides of the Tuning Capacitor Box (a).

g. Coaxial Cable Assembly

The Coaxial Cable Assembly is a 12 foot length of coaxial cable, with an RF isolator at the antenna end, used to connect the CHA P-LOOP Antenna to your radio.

h. Tuning Knob

The Tuning Knob is located on the bottom of the Tuning Unit (a) and is used to adjust the resonant frequency of the loop. The tuning capacitor, which rotates approximately 2 ¾ revolutions, is turned left, or counter-clockwise to increase the resonant frequency of the antenna and right, or clockwise, to decrease the resonant frequency of the antenna.

i. Coaxial Cable Connection

The Coaxial Cable Connection is a UHF socket located at the base of the Coupling Loop (c) and is used to connect the Coaxial Cable (g) to the radio.

j. Mast Handle

The Mast Handle is at the bottom of the Telescoping Mast (d). It can be use to hold the CHA P-LOOP in your hand for true man-portable operation.

k. Tripod Connection

The Tripod Connection is at the base of the Mast Handle (j). It is used to mount the CHA P-LOOP to a camera tripod or other antenna mount *(not included)* with a ¼" x 20 thread standard camera tripod screw. The tripod or mount must be heavy duty - capable of supporting the weight and size of the CHA P-LOOP.

l. Not used

m. Coupling Loop Strap

The Coupling Loop Strap is a sticky strap used to fasten the top of the Coupling Loop (c) to the Radiator Loop (b).

n. Coupling Loop Attachment

The Coupling Loop Attachment is used to attach the Coupling Loop (c) to the top of the Telescoping Mast (d).

o. Coupling Loop Adjustment

The Coupling Loop Adjustment is used to tighten the Coupling Loop Attachment (n).

p. Portable Bag

The Portable Bag, see plate (1), is a Khaki colored classic military-style messenger bag used to store and transport the components of the CHA P-LOOP, making it easily transportable.

Loop Assembly

The CHA P-LOOP antenna should be located near the radio set and can be installed either indoors or outside. The CHA P-LOOP is weather resistant to dripping water when mounted vertically. Because the magnetic component of an electromagnetic wave is maximum at the boundary between the ground and the space above, loop performance is usually best when the loop is located near the ground at a distance outside of the loop's close-in induction field (just a loop diameter or two). Do not use an antenna tuner or coupler with this antenna, as it may cause you to mistune the antenna.

Perform the following steps to assemble the Portable Loop Antenna, see plate (2).

1. Select a location to setup the CHA P-LOOP antenna. The location can be indoors or outside, but should facilitate accessibility by the operator to the Tuning Knob (h). The operator needs to be able to adjust the Tuning Knob while listening to the receiver, activating the transmitter, and observing the SWR meter. If used indoors, the location should also be reasonably away from switching power supplies, Internet routers, and other sources of electrical and electronic interference.
2. Remove the CHA P-LOOP components from the Portable Bag (p).

3. Extend the lower section of the Telescoping Mast (d) by loosening the bottom Telescoping Mast Clamp (e) and pulling the bottom tube until it is fully extended. Re-tighten the Telescoping Mast Clamp.
4. Similarly, extend the middle section of the Telescoping Mast until it is around an inch from being fully extended. The Telescoping Mast should be approximately 25 inches in length from the bottom Telescoping Mast Clamp to the Coupling Loop Attachment (n).
5. Attach the Coupling Loop (c) to the front top of the Coupling Loop Attachment by positioning the threaded hole in the metal bar at the base of the Coupling loop over the screw on top of the Coupling Loop Attachment and turning the knob under the attachment clockwise until finger tight.
6. Connect one end of the Flexible Radiator Loop (b) to the left Radiator Loop Connection (f).
7. Connect the other end of the Flexible Radiator Loop to the right Radiator Loop Connection.
8. Adjust the Coupling loop so that it is level and straight and in the same plane as the Flexible Radiator Loop and then tighten the Coupling Loop Adjustment (o) knob finger tight.
9. Secure the top middle of the Flexible Radiator Loop to the top middle of the Coupling Loop with the attached Coupling Loop Strap (m).
10. Connect the Coaxial Cable Assembly (g) to the Coaxial Cable Connection (i) at the bottom of the Coupling Loop.
11. Secure the Coaxial Cable Assembly to the Telescoping Mast using the attached sticky straps.
12. Mount the Tripod Connection (k) to a heavy duty camera tripod *(not included)* or hold the antenna using the Mast Handle (j).
13. Connect the unconnected end of the Coaxial Cable Assembly to the radio set.
14. Perform an operational test (see procedure below).
15. This completes assembly of the Portable Loop Antenna.

Loop Operation

The CHA P-LOOP is easy to use. Perform the following steps whenever you change frequency more than 7KHz:

1. The CHA P-LOOP is bidirectional favoring the sides, see plate (3). If possible, point one side toward the target signal and rotate the antenna for maximum signal strength.

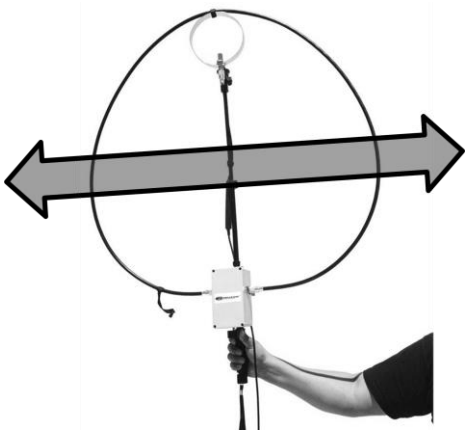

Plate 3. CHA P-LOOP Antenna Directivity.

2. Adjust the Tuning Knob (h) for maximum receive signal strength. Turn the Tuning Knob right or clockwise to decrease the resonant frequency and left or counterclockwise to increase the resonant frequency. You will know when you are close to resonant frequency because you will start hearing signals and a marked increase in receiver background noise. The Tuning Knob uses a 6:1 reduction drive which allows for fine adjustment and will rotate approximately 2¾ revolutions from lowest to highest frequency. Do not attempt to force the Tuning Knob past the stops.

3. Ensure your transmitter is set to output no more than 5 Watts during tuning.
4. Transmit a carrier and slowly turn the Tuning Knob slightly counterclockwise and then clockwise, around the position of highest receive signal found in step 2, to obtain the lowest SWR. An SWR of less than 2:1 is satisfactory. The bandwidth of the loop at 40 meters is only 15 KHz, so once you are close to resonance make only the slightest Tuning Knob adjustments.
   Due to the superior design of the CHA P-LOOP, there is minimal body induction while tuning the loop. The SWR should remain stable while tuning with your hand and operating while holding the antenna.
5. Increase transmitter power to no more than 25 Watts, see specifications.

Disassembly

1. Disconnect Coaxial Cable Assembly (g), neatly coil cable, and secure with attached sticky straps.
2. Disconnect Flexible Radiator Loop (b), carefully coil loop, and secure with attached sticky straps.
3. Fully collapse Telescoping Mast (d).
4. Loosen Coupling Loop Adjustment (o) knob and turn Coupling Loop Attachment (n) so that it perpendicular to the mast.
5. Place Tuning Unit (a) / Telescoping Mast assembly into Portable Bag (p) first and then place remaining components into Portable Bag.

Troubleshooting

1. Ensure the loop is away from metal surfaces. Sometimes simply reorienting, relocating, or elevating the loop around two to four feet higher will reduce the SWR.
2. Ensure Radiator Loop Connections (f) are securely tightened.
3. Inspect Flexible Radiator Loop (b) for damage. Replace if damaged.
4. Ensure the Coaxial Cable Connection (g) is securely tightened.
5. Inspect Coaxial Cable assembly for cuts in insulation or exposed shielding. Replace if damaged.
6. Turn Tuning Knob (h) fully clockwise.
7. Adjust Tuning Knob over entire range listening for a marked increase in received signal strength and receiver background noise.
8. If still not operational, replace Coaxial Cable assembly. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
9. If still not operational, contact us for technical support.

Preventive Maintenance

Like all of our products, the CHA P-LOOP is build to be rugged, long lasting and with details in mind. The craftsmanship of the system is unique to Chameleon Antenna™. The materials used in this antenna are water and rust resistant and do not require preventive maintenance, but they should be inspected for damage and cleaned with mild household cleaners after field use.

Specifications

- Frequency: 6.0 – 29.7 MHz continuous (40 through 10 meter ham bands)
- Power: 25W intermittent duty cycle (SSB and SSB-based digital), 10W continuous duty cycle (CW, AM, FM, RTTY)
- Dimensions:
  - Width: 33¾ Inches

    - Height: 42 Inches
    - Depth: 4½ Inches
- Weight: 7 lbs (including bag)
- SWR: Operator tunable, typically not greater than 1.5:1 at resonance and less than 2:1 for 15 KHz bandwidth at 7 MHz
- RF Connection: UHF Plug (PL-259)
- Feed Line: 12 Feet of RG-58 with Integrated RFI Choke
- Personnel Requirements and Setup Time: one operator, around 2 minutes
- Water Resistant when mounted vertically *(comparable to IP1 standard / not tested)*
- Carrying Bag:
    - Style: Classic Military Messenger Bag
    - Color: Khaki
    - Material: 100% Cotton Canvas / 100% Polyester lining
    - Dimensions: 19 Inches Width x 14.5 Inches Height x 7 Inches Depth
    - Source: Imported

Notes

1. Do not use an antenna tuner or coupler with this antenna.
2. Do not use this antenna below 6.0 MHz.
3. This antenna cannot be used with the CHA F-LOOP 80m Conversion Kit.
4. This antenna is only water resistant when mounted vertically. Do not mount this antenna horizontally during inclement weather.

Accessories

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

- **Coaxial Cable Assembly.** 50 feet of RG-58 with integrated RFI Choke. Used to connect the CHA P-LOOP to the radio set.

Recommended non-supplied accessories:

- Heavy duty camera tripod
- SWR / power meter

Chameleon Antenna™ Products

The following products are available for purchase at Chameleon Antenna™.
Go to http://chameleonantenna.com *for ordering and more information.*

CHA SKYLOOP - The CHA SKYLOOP is a 250' full wave loop antenna cut for 80M. With the help of an antenna tuner, the CHA SKYLOOP will cover all the bands between 80M and 6M.

CHA EMCOMM II - The CHA EMCOMM II Antenna has been specially designed for backup emergency HF system or permanent installation. The integral broadband impedance matching network allows broadband antenna tuning.

CHA WINDOM 40 – The CHA WINDOM 40 Antenna is designed for 40, 20, and 10 meters. Amateur Bands from 60 through 10 meters can be operated using an antenna tuner. Built with the portable operator in mind, it is very light weight, easy to set up, and comes with a military-style pouch.

CHA HYBRID Vehicular Base - The CHA HYBRID Vehicular Base is designed to enhance the capabilities of the common HF radio application by allowing faster tuning operation across the HF bands including MARS/CAP frequencies. This antenna base has an integral broadband impedance matching network allowing broadband antenna tuning. The CHA HYBRID can be used mobile with the CHA V1L and V2L mobile antennas or stationary with the provided 30' wire.

CHA V1 Mobile Antenna - The CHA V1 antenna is our first and classic broadband HF mobile antenna that we designed. It has been updated from fiberglass to 7075 alloy and stainless steel.

CHA V1L Mobile Antenna - The CHA V1L antenna is a rugged multiband HF mobile antenna that can be erected in a minimum of time and space.

CHA V2L Mobile Antenna - The CHA V2L is a rugged multiband HF antenna designed for smaller vehicles.

CHA VHF/UHF Magnetic Mount Mobile Antenna - The CHA VHF/UHF is a simple but great dual band antenna for 2M and 70CM.

CHA Hybrid Mini – Portable HF Antenna Base - The CHA HYBRID-MINI Base is the portable version of the regular HYBRID. The unit can be differentiated by the color of the lid and the base connector, which is black instead of gray. The HYBRID-MINI is also smaller and about 50% lighter than the regular HYBRID. An external antenna tuner is required to provide a low VSWR. The connector provided with the antenna is a SO-239 sealed. The entire unit is also waterproof. The HYBRID-MINI will serve as impedance transformer matching network (transformer 5:1) and will greatly reduce the VSWR at the load for the following antennas: V1, V1L, V2L and MIL.

CHA Hybrid Micro - Portable HF Antenna Base -
The CHA HYBRID-MICRO is a lightweight highly portable broadband antenna system designed to offer maximum portability and performance. The antenna weights about 1 lb. The antenna will operate at all frequencies in the 1.8-54 MHz band without any adjustment with most modern external antenna tuners. No masts or guying are required. The antenna will work successfully supported by trees, masts, the tops of vehicles or any convenient object or structure. The antenna works most effectively when elevated at a reasonable height.

CHA MIL Whip - The CHA MIL whip is a broadband (28 to 54 MHz) monopole antenna designed for portable or man-pack radios requiring compact but rugged antenna systems. Its design has been borrowed from similar antennas utilized by many armies all over the world. The CHA MIL is very hardy, sturdy and portable (being collapsible). Un-mounted the entire antenna length is less than 29”. The 5 aluminum sections are hold together by a piece of 1/8th inch US GI MIL SPEC shock cord. The CHA MIL

Whip and a CHA HYBRID-MINI Base perfectly complements the capability of the CHA P-LOOP.

CHA MIL EXT Whip Extension - The CHA MIL EXT whip has been designed to offer maximum portability and performance for those already using the portable CHA MIL whip for man-pack antenna system. This collapsible antenna extension needs to be used with the CHA MIL to create a 17'4" long portable antenna. When combined with any HYBRID series antenna bases the CHA MIL EXT will operate at all frequencies in the 1.8-54 MHz band without any adjustment with most modern external antenna tuners.

CHA TD Tactical Dipole LITE - The CHA TD LITE (Tactical Dipole LITE) is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential but compactness is primary. The antenna will operate at all frequencies in the 1.8-54 MHz band without any adjustment with most modern external antenna tuners. No masts or guying are required.

CHA TD Tactical Dipole - The CHA TD (Tactical Dipole) Antenna has been designed as an add-on for the CHA P-LOOP. The CHA TD is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential. The antenna will operate at all frequencies in the 1.8-30 MHz band without any adjustment with most modern internal antenna tuners. It is ideal for use in conjunction with modern, digitally configured, HF communication transceivers where features such as ALE and frequency hopping require true broadband capability. No masts or guying are required. The CHA TD can also be used without antenna tuner, as the SWR will stay under 2.5:1 between 10M and 80M and under 2.75:1 on 160M.

References

1. Silver, H. Ward (editor), 2013, *2014 ARRL Handbook for Radio Communications*, 91st Edition, American Radio Relay League, Newington, CT.
2. 1987*, Tactical Single-Channel Radio Communications Techniques (FM 24-18)*, Department of the Army, Washington, DC.
3. Turkes, Gurkan, 1990, *Tactical HF Field Expedient Antenna Performance Volume I Thesis*, U.S. Naval Post Graduate School, Monterey, CA.