Base HF Antenna
(CHA ZEPP)
Operator's Manual

California - USA
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VERSATILE – DEPENDABLE – STEALTH – BUILT TO LAST

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Be aware of overhead power lines when you are deploying the CHA ZEPP antenna system. You could be electrocuted if the antenna gets near or contacts overhead power lines.

Introduction

Thank you for purchasing and using the Chameleon Antenna™ High Frequency (HF) Base Antenna (CHA ZEPP). The CHA ZEPP Antenna has been specially designed for apartments, condominiums, homeowners associations, deed restrictions and CCRs (Covenants, Conditions & Restrictions), ARES, RACES, MARS, EMCOMM, NVIS, First Responders, Emergency Preparedness, Shortwave Listening (SWL), and attic antenna installation. It's a true base station or portable stealth antenna. The antenna is 75' long and covers 3.5 MHz to 30.0 MHz (80 – 10 meter ham bands). The Zepp is composed of a 25 foot matching section and a 50 foot radiator section. The CHA ZEPP does not require any ground-plane, but a counterpoise installed at the base of the unit will increase the performance. The CHA ZEPP antenna requires a wide range antenna tuner or coupler (external antenna tuner). 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 ZEPP 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 and which of the CHA ZEPP 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.

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.

Parts of the Antenna

The CHA ZEPP is comprised of the following components, see plate (1):

a. Matching Transformer

The Matching Transformer provides impedance matching for the CHA ZEPP antenna.

b. Antenna Wire

The Antenna Wire is black insulated wire and has a 25 foot Matching Section and 50 foot Radiator Section.

c. Strain Relief Insulator

The Strain Relief Insulator, see plate (2), is attached to the end of the Antenna Wire (b) Matching Section.

d. Carabiner

The Carabiner is a removable pear-shaped stainless steel hooks with a spring-loaded gate.

e. End Insulator

The End Insulator is permanently attached to the end of the Radiator Section of the Antenna Wire (b).

Plate 1. CHA ZEPP Antenna.

f. Wire Connector

The Wire Connectors are located at the Matching Section end of the Antenna Wire (b).

g. Counterpoise / Ground Connection

The Counterpoise / Ground Connection is located on the bottom of the Matching Transformer (a) and provides a connection for an optional counterpoise / ground.

Plate 2. Strain Relief Insulator.

h. UHF Socket

The UHF Socket, SO-239, is located on the bottom of the Matching Transformer (a).

i. Transformer Eyebolt

The Transformer Eyebolt is located on the top of the Matching Transformer (a), see plate (3).

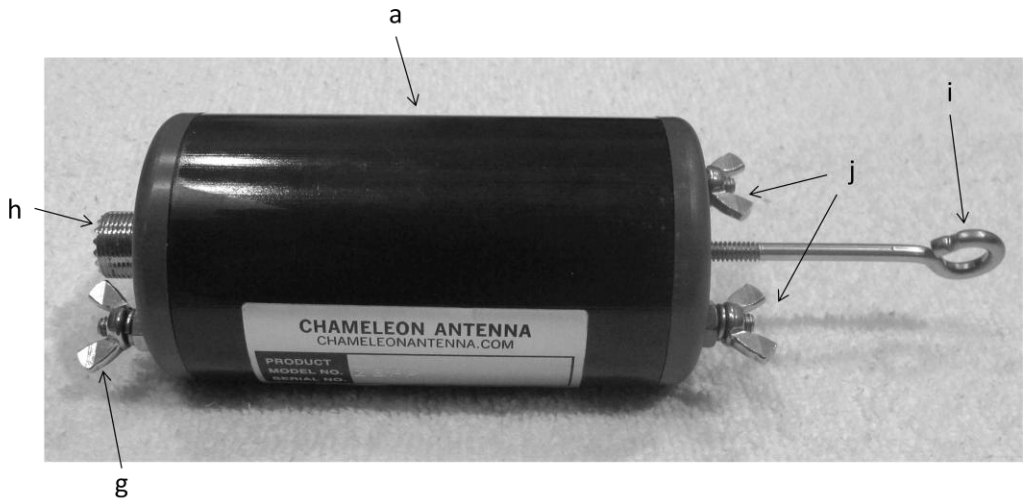

Plate 3. Matching Transformer.

j. Antenna Connection.

The Antenna Connections, for the two wires of the Antenna Wire Matching Section, are located on the top of the Matching Transformer (a).

ZEPP Configurations

The CHA ZEPP can be installed in a variety of configurations depending upon your situation. The most important considerations are that the components of the antenna remain away from metallic objects and that the radiator section be reasonably high and as straight as practical (one bend in the radiator section for a "V" or "L" is acceptable). This manual will discuss the three primary configurations: Horizontal, Sloping, and Inverted "L". The Horizontal Configuration is excellent for NVIS, especially when mounted low (around 10-15 feet). The CHA ZEPP is a good long-distance (DX) antenna when installed as in a Sloping Configuration, particularly when installed at an angle of around 45 degrees. The traditional Zepp Inverted "L" configuration is good when you don't have the room for the horizontal configuration, like if you want to install your antenna in an attic or small city lot. In any configuration, the coaxial cable should be at least 25 in length and you must use a wide range antenna tuner or coupler (external antenna tuner).

Horizontal Configuration

Perform the following steps to install the CHA ZEPP in the Horizontal Configuration, see figure (1).

Site Selection and Preparation.

1. Select a site to deploy the CHA ZEPP horizontal antenna configuration. The site must have two supports that will position the ends of the antenna at least 75 feet apart and 10 to 15 feet high for NVIS and higher than 25 feet for medium range sky wave propagation.
2. Connect the Carabiner (d) to the Transformer Eyebolt (i).

Connect the Matching Transformer. Refer to Figure (2) for steps (3) – (7).

3. Connect the Carabiner to the largest round hole in the Strain Relief Insulator (c).
4. Remove the wing nut from the Antenna Connection (j) marked with a red hex nut.

5. Connect the red Wire Connector (f) to the Antenna Connection and replace the wing nut. Tighten finger tight.
6. Remove the wing nut from the other Antenna Connection.
7. Connect the black Wire Connector to the Antenna Connection and replace the wing nut. Tighten finger tight.

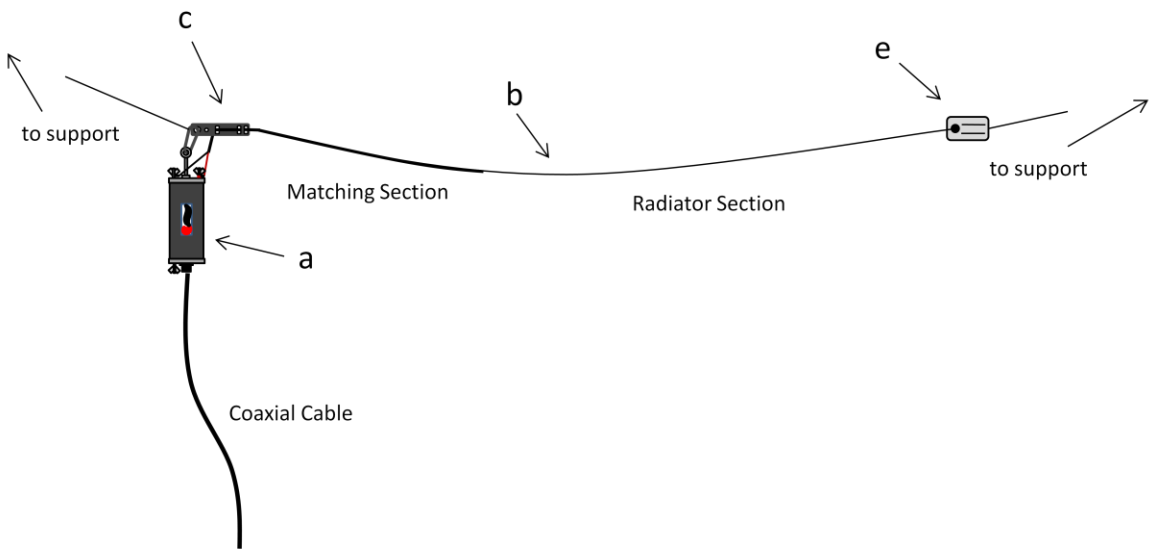

Figure 1. Horizontal Configuration.

Raise the Antenna

8. Attach a long length of Paracord (around 50 feet) to the End Insulator (e) using a Bowline or similar knot.
9. Using a throw weight or other method, loop the Paracord over the end support.
10. Raise the Radiator Section of the Antenna Wire (b) to the desired height and secure the Paracord to the support using a round turn and two half hitches or similar knot.
11. If used, connect the counterpoise / ground wire to Ground Connection (g) on the Matching Transformer.
12. Connect a CHA RFI CHOKE and coaxial cable or Integrated RF Choke end of the CHA Coaxial Cable assembly to the UHF Socket (h) on the Matching Transformer.
13. Attach a long length of Paracord (around 50 feet) to the Carabiner using a Bowline or similar knot.

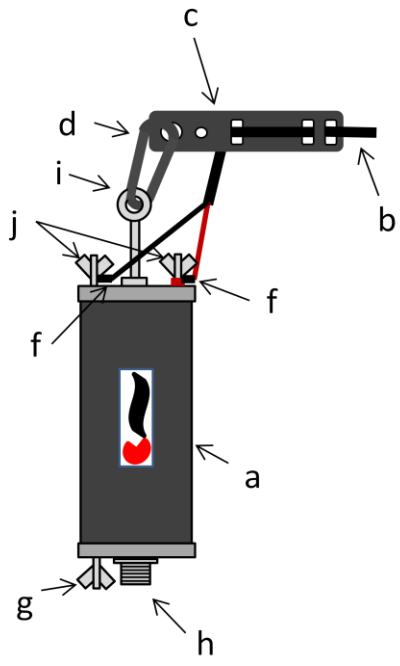

Figure 2. ZEPP Matching Transformer Electrical and Mechanical Connections.

14. Using a throw weight or other method, loop the Paracord over the other end support.
15. Raise the end of the Antenna Wire with the Matching Section to the desired height and so that the Antenna Wire is not quite taut.
16. Secure the Paracord to the support using a round turn and two half hitches or similar knot.
17. Perform an operational test.
18. This completes installation of the CHA ZEPP Horizontal Configuration.

Sloping Configuration

Perform the following steps to install the CHA ZEPP in the Sloping Configuration, see figure (3).

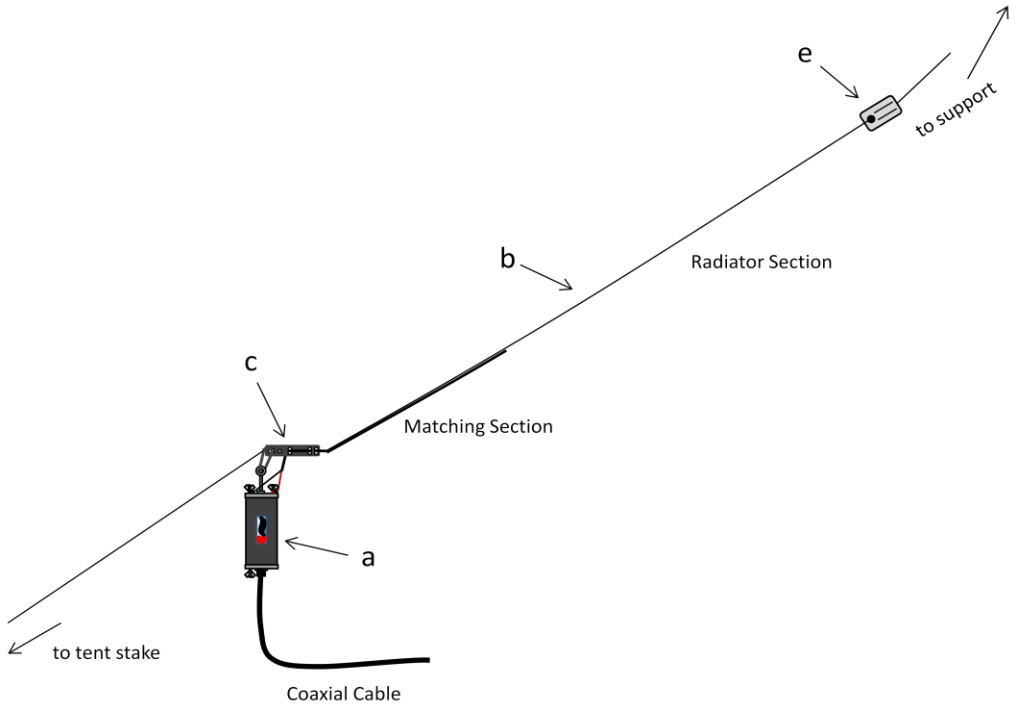

Figure 3. Sloping Configuration.

Site Selection and Preparation.

1. Select a site to deploy the CHA ZEPP sloping antenna configuration. The site must have a support that will position the end of the antenna at least 25 feet in height and should have around 70 feet of clear ground towards the location of the tent stake or lower support.
2. Connect the Carabiner (d) to the Transformer Eyebolt (i).

Connect the Matching Transformer. Refer to Figure (2) for steps (3) – (7).

3. Connect the Carabiner to the largest round hole in the Strain Relief Insulator (c).
4. Remove the wing nut from the Antenna Connection (j) marked with a red hex nut.
5. Connect the red Wire Connector (f) to the Antenna Connection and replace the wing nut. Tighten finger tight.
6. Remove the wing nut from the other Antenna Connection.
7. Connect the black Wire Connector to the Antenna Connection and replace the wing nut. Tighten finger tight.

Raise the Antenna

8. Attach a long length of Paracord (50 feet or more) to the End Insulator (e) using a Bowline or similar knot.
9. Using a throw weight or other method, loop the Paracord over the end support.
10. Raise the Radiator Section end of the Antenna Wire (b) to the desired height and secure the Paracord to the support using a round turn and two half hitches or similar knot.
11. If used, connect the counterpoise / ground wire to Ground Connection (g) on the Matching Transformer.
12. Connect a CHA RFI CHOKE and coaxial cable or Integrated RF Choke end of the CHA Coaxial Cable assembly to the UHF Socket (h) on the Matching Transformer.
13. Attach a short length of Paracord (around 10 feet) to the Carabiner using a Bowline or similar knot.
14. Tie a Bowline in the free end of the Paracord and place a tent stake through it.
15. Pull the Paracord and tent stake to the ground away from the already raised end of the antenna so the antenna is not quite taut.
16. Drive the tent state into the ground at that location. The Antenna Wire should be not quite taut and the Matching transformer should be suspended at around six to eight feet high above the ground.
17. Perform an operational test.
18. This completes installation of the CHA ZEPP Sloping Configuration.

Inverted "L" Configuration

Perform the following steps to install the CHA ZEPP in the Sloping Configuration, see figure (4).

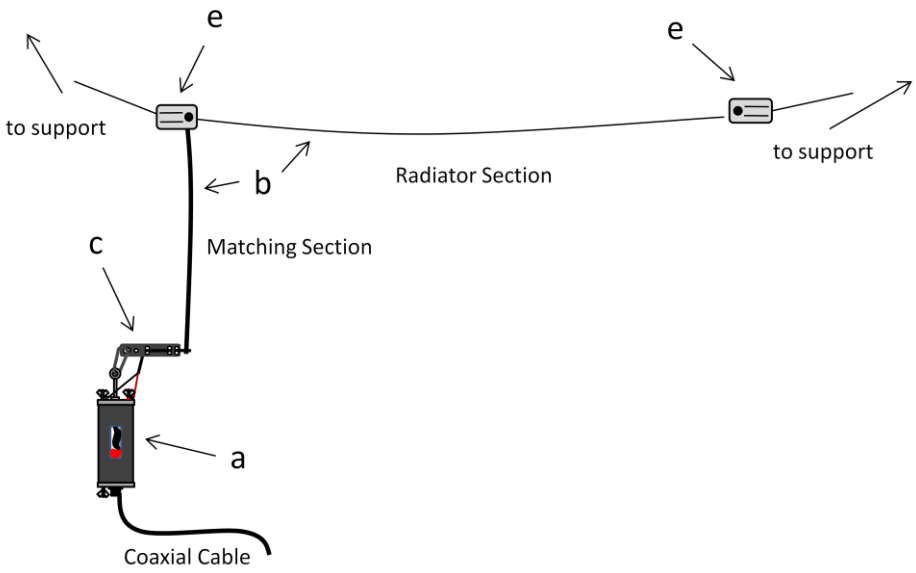

Figure 4. Inverted "L" Configuration.

Site Selection and Preparation.

1. Select a site to deploy the CHA ZEPP Inverted "L" antenna configuration. The site must have two supports that will position the ends of the antenna at least 50 feet apart and 25 feet high.
2. Connect the Carabiner (d) to the Transformer Eyebolt (i).

Connect the Matching Transformer. Refer to Figure (2) for steps (3) – (7).

3. Connect the Carabiner to the largest round hole in the Strain Relief Insulator (c).
4. Remove the wing nut from the Antenna Connection (j) marked with a red hex nut.
5. Connect the red Wire Connector (f) to the Antenna Connection and replace the wing nut. Tighten finger tight.
6. Remove the wing nut from the other Antenna Connection.
7. Connect the black Wire Connector to the Antenna Connection and replace the wing nut. Tighten finger tight.

Raise the Antenna

8. Attach a long length of Paracord (around 50 feet) to the End Insulator (e) using a Bowline or similar knot.
9. Using a throw weight or other method, loop the Paracord over the far end support.
10. Raise the far end of the Antenna Wire (b) Radiator Section to the desired height and secure the Paracord to the support using a round turn and two half hitches or similar knot.
11. If used, connect the counterpoise / ground wire to Ground Connection (g) on the Matching Transformer.
12. Connect a CHA RFI CHOKE and coaxial cable or Integrated RF Choke end of the CHA Coaxial Cable assembly to the UHF Socket (h) on the Matching Transformer.
13. Using a customer supplied insulator, similar to the supplied large ceramic End Insulator, attach the Radiator Section of the Antenna Wire to the insulator, just beyond the end of the Matching Section, using a slip knot.
14. Attach a long length of Paracord (around 50 feet) to the Insulator using a Bowline or similar knot.
15. Using a throw weight or other method, loop the Paracord over the near end support.
16. Raise the near end of the Antenna Wire Radiator Section to the desired height and secure the Paracord to the support using a round turn and two half hitches or similar knot. The Matching Section of the Antenna Wire will be hanging vertically, as shown.
17. Perform an operational test.
18. This completes installation of the CHA ZEPP Inverted “L” Configuration.

Troubleshooting

1. Ensure Wire Connectors (f) are securely connected and the red Wire Connector is connected to the Antenna Connection (j) with the red hex nut.
2. Inspect Antenna Wire (b) for breakage or signs of strain.
3. Ensure UHF Plug is securely tightened.
4. Inspect Coaxial Cable assembly for cuts in insulation or exposed shielding. Replace if damaged.
5. If still not operational, connect a Standing Wave Ratio (SWR) Power Meter and check SWR.
6. If SWR is greater than 12:1, check antenna tuner or coupler using the technical manual or manufacturer’s procedure. Be sure to check the Coaxial Patch Cable that connects the radio set to the antenna tuner or coupler.
7. If still not operational, replace Coaxial Cable assembly. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
8. Connect a Multi-Meter to the Antenna Wire to check continuity. Replace assemblies that do not pass a continuity check.
9. If still not operational, replace Matching Transformer (a).

Specifications

- Frequency: 3.5 – 30 MHz (80m through 10m ham bands) *requires a wide range antenna tuner or coupler*
- Power: 500 W continuous duty cycle (CW, AM, FM, RTTY), 1000W intermittent duty cycle (SSB and SSB-based digital modes)
- Length: 75 feet (50 feet Radiator Section plus 25 feet Matching Section)
- RF Connection: UHF Plug (PL-259)
- SWR: Subject to frequency and installation, but within limits of most wide range antenna tuners or couplers.
- Weight: 3 lbs
- Personnel Requirements and Setup Time: one operator, around 15 minutes

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 ZEPP to the radio set. This is a highly recommended accessory if you are not using a CHA RFI CHOKE.
- **RF Choke Assembly.** The CHA RFI CHOKE will prevent, greatly reduces or totally eliminates the RFI carried by the coax cable. It can be installed either at the antenna feed point or right behind the antenna tuner. This accessory is highly recommended if you are not using the Chameleon Antenna™ Coaxial Cable Assembly.

Recommended non-supplied accessories:

- Wide range antenna tuner or coupler (*required for all configurations).*
- Flashlight.
- Multi-tool.
- Throwing weight and string.
- Mallet.
- SWR Power Meter.
- Multi-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 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 ZEPP.

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 primordial. 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 ZEPP. 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.