PERformer (Portable, Elevated, Resonant) Antenna by KJ6ER

Introduction

The **PERformer (Portable, Elevated, Resonant)** is a resonant *one-band-at-a-time* elevated quarterwave vertical antenna for **40M-6M** sitting on a tripod or PVC ground spike with the feedpoint 4-5 feet off the ground and **two elevated tuned linked radials 90° apart**. This is a great portable antenna – easy to pack, fast to deploy, very effective and highly efficient!

I have computer modeled the antenna extensively in 4NEC2 and derived optimal whip and elevated tuned radial lengths. You will have to experiment in your own surroundings to finetune these, but I typically get **<1.10:1 SWR** on all bands. I have found through modeling, testing and extensive experience in the field, this elevated vertical is over **90%** efficient and better than any ground-mounted version I have ever used. For comparison, a typical ground-mounted quarterwave vertical antenna at resonance with four ground-coupled radials is only **37%** efficient!

Elevated Tuned Linked Radials

The two elevated tuned radials are 90° apart to provide modest **gain** (**0.3-0.5 dBi** at the *maximum radiation angle*) and some **directionality** (**3-4 dB** *front-to-back ratio*) within the 90° span. If an omnidirectional radiation pattern is preferred, place the two elevated radials 180° apart (opposite).

Having elevated tuned radials dramatically reduces near-field ground losses and increases directional gain versus a purely ground-mounted vertical with ground-coupled radials. With an antenna **efficiency** over 90%, I regularly get comments like "*you're the loudest signal on the band*" from POTA hunters.

The 20M-6M bands are all available using the 17' whip. For 40M, I install an inductor (such as the Wolf River Coils™ Sport Forty) at the base of the whip. For the radial, I clip the two 20M 16.5' radials end-to-end with the two fiberglass stakes (one in the center, one at the end) to have *one* elevated 33' 40M radial.

Antenna System Parts List with Prices and Links (as of December 2024)

Here are the components I *recommend* for the **PERformer** (substitute as you wish):

- Chameleon™ CHA SS17 17' telescoping whip ($70) – chameleonantenna.com/shop-here/ols/products/cha-ss17
- Furniture grade PVC (tripod *alternative,* $28 for 4 tubes) – amazon.com/gp/product/B0876M7C2B
  Chameleon™ CHA spike mount for PVC ($65) – chameleonantenna.com/shop-here/ols/products/cha-spike-mount
- Polarduck™ 78" tripod ($46) – amazon.com/dp/B0CNYK89TX
- Palomar Engineers™ RF Feedline Choke, 1.8-65 MHz ($30) – palomar-engineers.com/ferrite-products/Coax-Jumper-Choke-RG-8X-RFI-Range-1-8-65-MHz-30-dB-Noise-Reduction-1-5KW-PEP-Magnetic-Loop-Antenna-Choke-p159344870
- Mirror mount with 3/8x24 to SO-239 stud – amazon.com/dp/B01G2QSNDG
- BNTECHGO bright orange 18 AWG radials ($18 for 100' spool) – amazon.com/dp/B01MPZJOYN
- Mueller™ BU-55 steel clips for the radials ($15 for 10 pieces) – amazon.com/dp/B00LPP8Q00
- Fiberglass 4' orange stakes to elevate radials ($20 for 20 stakes) – amazon.com/dp/B0B55N8THZ

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Traditional Calculations vs. 4NEC2 Computer Model Computations

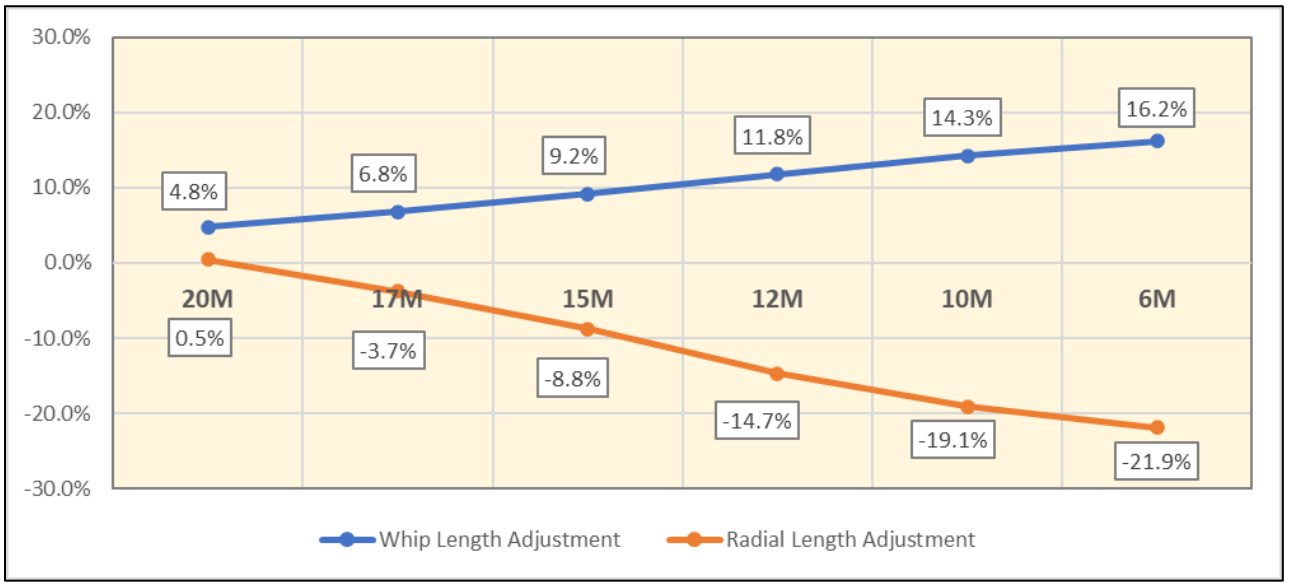
Below are the **traditional quarterwave calculations** (234 / f) vs. **computer model computations** for the 20M-6M bands. When using elevated radials rather than surface (or ground) radials, **antenna efficiency rises dramatically to over 90%** due to less *loss resistance* from capacitive ground coupling (in series with the antenna *radiation resistance*). However, elevating radials also typically lowers the overall **antenna impedance** below 50 ohms due to its low loss resistance.

The best way to raise impedance is to angle the radials downward slightly from the feedpoint, typically 30-40°. If this so-called **droop angle** cannot be made big enough, the radiator can be lengthened *up to 20%* and the radials must be shortened accordingly. In essence, this can be thought of as *off-center feeding* a dipole. Note in the table below, the **OCF %** is calculated as **51%** on 20M to **60%** on 6M.

Thus, the model generated a **longer radiator** (**+5%** on 20M to **+16%** on 6M) and a **shorter radial pair** (**+0.5%** on 20M to **-22%** on 6M) to achieve optimal impedance. In the table, the elevated radial droop angle from the feedpoint to the radial end is calculated as 5° on 20M to 22° on 6M.

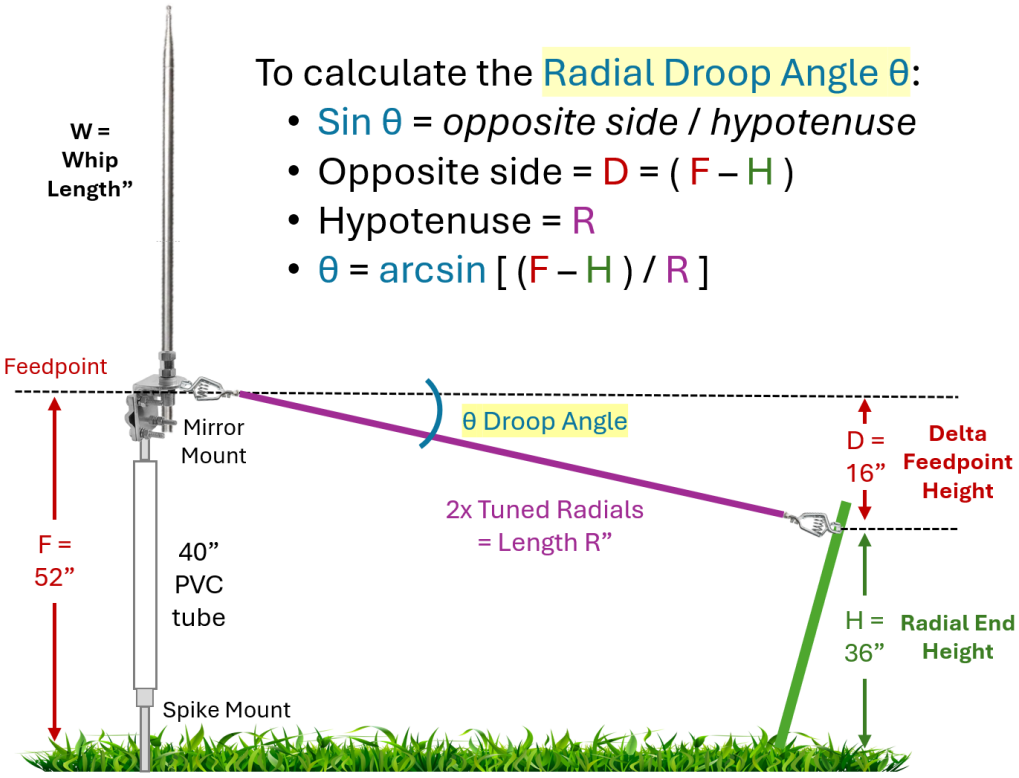
Note: Droop angle only applies when you are ***not*** using **non-conductive segments** within the radial lines.

Band	Target Freq (Mhz)	234 / f		Radiator				Counterpoise					
		Length	Inches	Length	Inches	Whip vs. Calc	Whip OCF %	Length	Inches	Radial vs. Calc	Radial End (in)	Radial End vs. λ	Droop Angle (deg)
20M	14.250	16' 5"	**197**	17' 3"	**207**	4.8%	51.1%	16' 6"	**198**	0.5%	**36**	**5%**	**5**
17M	18.140	12' 11"	**155**	13' 9"	**165**	6.8%	52.6%	12' 5"	**149**	-3.7%	**36**	**6%**	**6**
15M	21.350	11' 0"	**132**	12' 0"	**144**	9.2%	54.5%	10' 0"	**120**	-8.8%	**36**	**7%**	**8**
12M	24.940	9' 5"	**113**	10' 6"	**126**	11.8%	56.7%	8' 0"	**96**	-14.7%	**36**	**8%**	**10**
10M	28.400	8' 3"	**99**	9' 5"	**113**	14.3%	58.5%	6' 8"	**80**	-19.1%	**36**	**9%**	**12**
6M	51.000	4' 7"	**55**	5' 4"	**64**	16.2%	59.8%	3' 7"	**43**	-21.9%	**36**	**16%**	**22**



Calculating the Elevated Radial Droop Angle

Whether deploying the PERformer tripod or PVC spike mount, the feedpoint is approximately 52” above the ground and the radial ends are about 36” high when clipped to the fiberglass stake. Using the basic ***sin function*** (opposite side / hypotenuse), the droop angle can be *approximated* for each band. If using non-conductive segments in the radial lines, the droop angle will remain constant around 5°.



Finetuning the Antenna in the Field

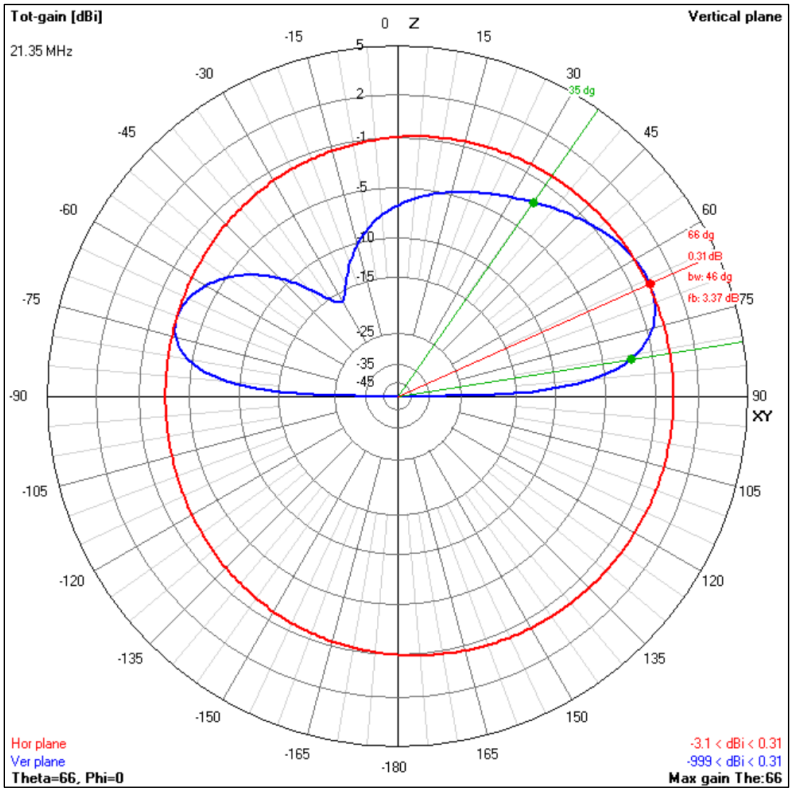
While the computed **radial length and end height for each band remains fixed**, the antenna system resonance can easily and quickly be finetuned with use of an **antenna analyzer** (or your rig’s SWR meter) by slightly adjusting the length of the telescoping whip once the radials have been attached.

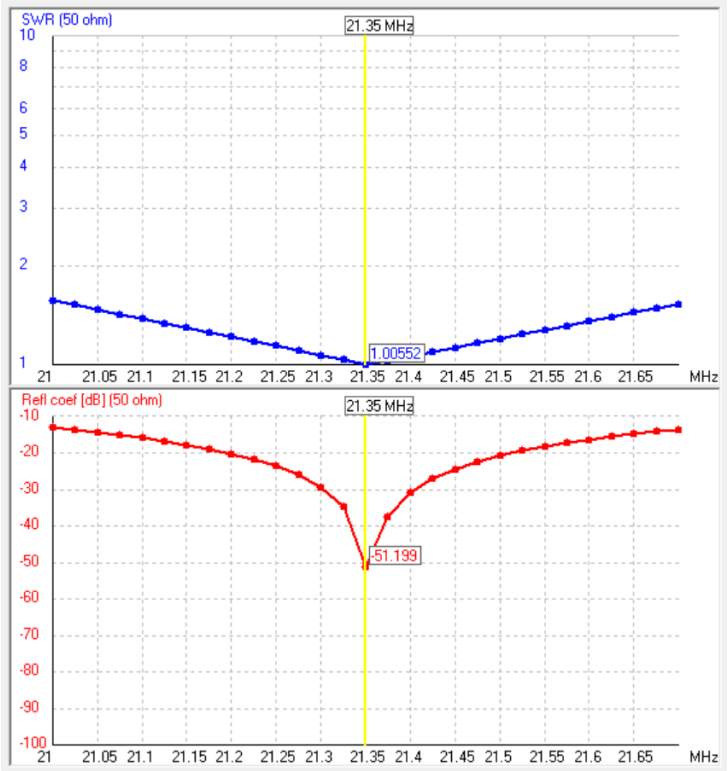
Since every portable deployment will have **different soil and near field surroundings**, I recommend remembering or documenting generally where to extend the telescoping whip *initially* for a particular band and then make finetuning adjustments from there. You will find that the precise whip length will likely vary at each deployment depending.

It is imperative that a good quality **RF choke** be inserted directly at the feedpoint so that the coax feedline *does not* become part of the antenna system. If excluded, *common mode currents* (CMC) and *radio frequency interference* (RFI) will likely disrupt optimal antenna operation and cause issues with inconsistent radiation patterns and SWR measurements.

Because of the resonant characteristics of this antenna, an external antenna tuner is *not* typically required at the rig or antenna base potentially reducing any losses caused by these components and saving on packing. **Resonant antennas are always the best and most efficient antennas!**

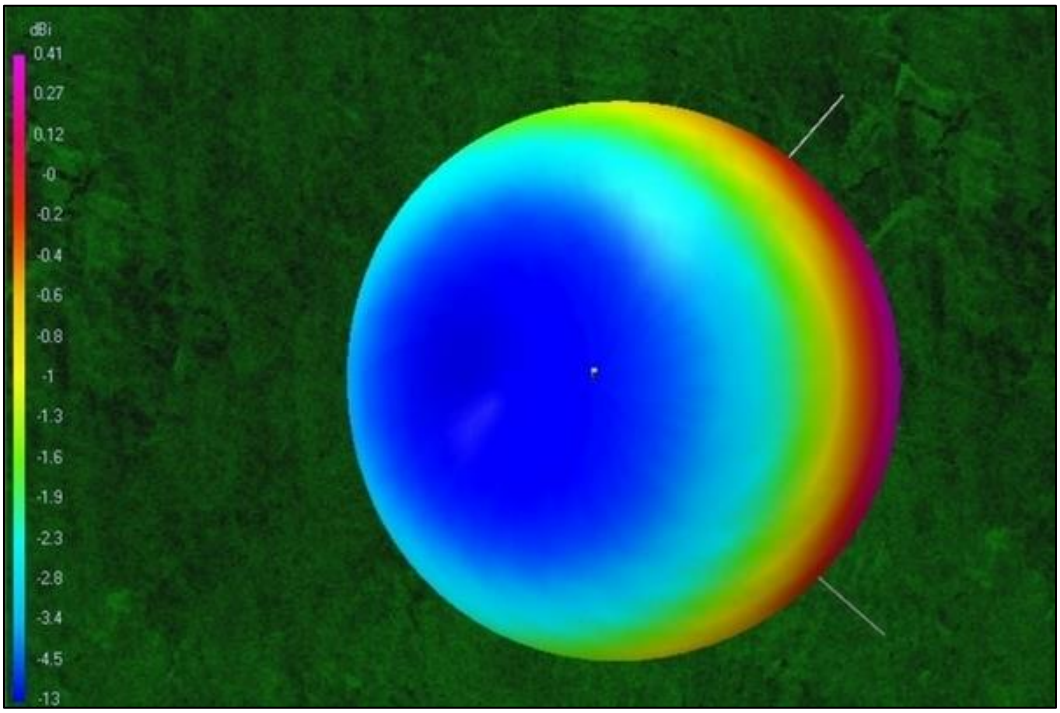
4NEC2 Computer Model Graphics Showing the Far-Field Radiation Pattern (vertical, horizontal planes) and Reflection Coefficient (RC) for 15M (21.350 MHz). Note the directionality evident in the **vertical** plane. The maximum gain of **+0.31 dBi** occurs at **24°** off the horizon with a -3 dB beamwidth of **46°** (-15°, +31°). The front-to-back is **3.37 dB**. The reflection coefficient is a very high **-51.2 dB**.

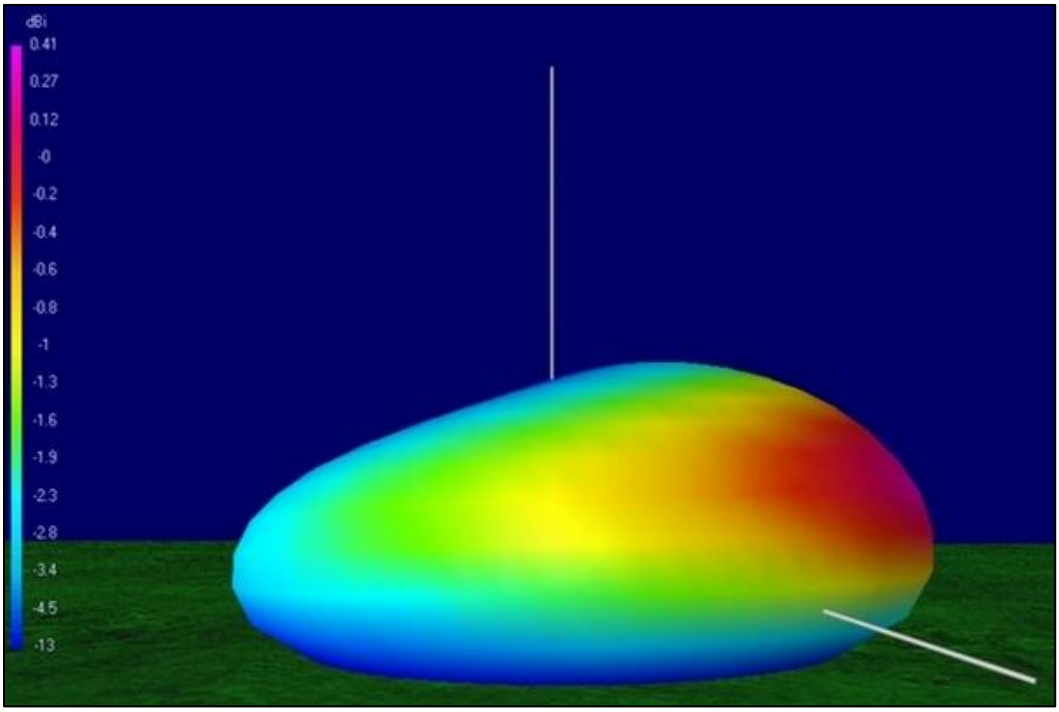




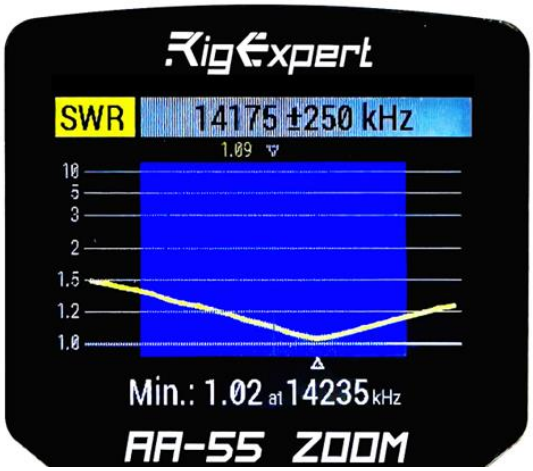
4NEC2 Computer Model Graphics Showing the Colorful 3D Radiation Patterns as seen from Above and the Side for 15M (21.350 MHz). The **purple** and **red** edges of the radiation pattern highlight the strongest directional characteristics of the antenna. Note the **directionality** off the elevated radials is evident in both views (white lines **90°** apart).

As mentioned earlier, if **omnidirectional** coverage is preferred, simply place the two elevated radials **180°** apart (opposite each other). This will *negate* the directionality and the front-to-back ratio.

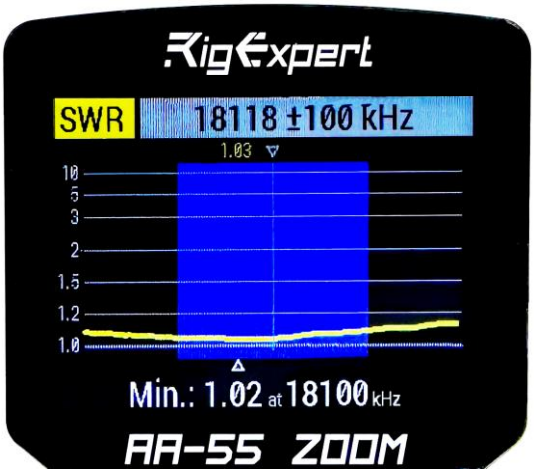




Field SWR Measurements for the PERformer Antenna for Each Band (20M-6M). Note the very low SWR at band resonance and the broad bandwidth which typically covers the entire band. You will never need an antenna tuner! In fact, even with a **1.50:1** SWR, your power throughput efficiency is **96%**.



20M Band

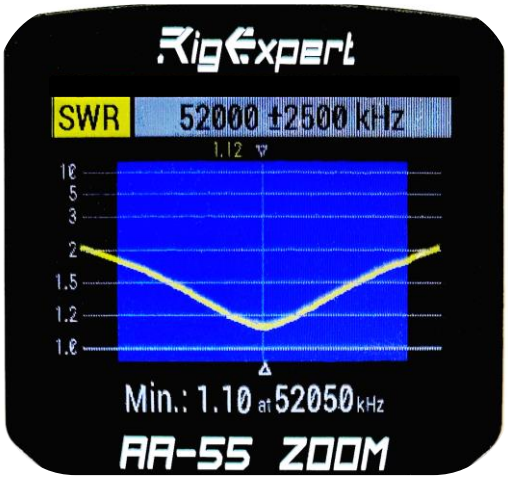


17M Band

15M Band

12M Band

10M Band



6M Band

Antenna Deployment Showing Tripod Configuration and Radial Clips. Mueller™ clips are fantastic antenna building components. They clip on and off easily for fast deployment and take-down. The silicon-coasted radial wire alleviates annoying tangles in the field. One clip is used to combine both elevated radials at the feedpoint and another clip is used at the end of each elevated radial for the stake.

Elevated Radial Deployment with Radial Clip. A Mueller™ clip at the end of each radial is attached to a non-conductive stake. A reliable trick to ensure tension on the radials is to insert the *fiberglass* stake into the ground at a *60° angle* with the clip about *halfway up* the stake. Once attached, *slide the clip* up to the top until the radial is taut. A little sagging in the line is fine.

If *not* using a non-conductive radial segment insert, the **droop angle** from the feedpoint to the stake varies from 5° on 20M to 22° on 6M. In theory, a 30° to 40° droop angle will raise impedance close to 50 ohms. Given that these angles are less, the radiator was extended slightly, and the radials were shortened to achieve optimal resistive impedance at resonance.

PVC Tube with Spike Mount Deployment

Most of the time in the field, I prefer to deploy my PERformer antenna using a PVC spike mount instead of a tripod, leveraging a 40" furniture grade PVC tube and the Chameleon™ spike mount (or a *flat* tripod).

I like the **40" tube length** because it is not too tall for me to reach the telescoping whip to adjust it for the band of operation, and still keeps the feedpoint elevated around 52". The non-metallic PVC tube is also optimal because, unlike tripod legs, it does not interact with the shortest antenna radials, especially on the upper bands (10M-6M).

I prefer using **furniture grade PVC** because the walls are slightly thicker than the traditional irrigation type which provides more support for the antenna, especially when the whip is fully extended in the wind. Of course, feel free to use whatever pipe you have on hand.

In the top end cap, I drilled a 3/8" hole for a 3/8-24 fine thread bolt and a 1-1/2" x 3/8-24 nut on the outside. I use split lock and fender washers for a rigid, tight fit. The bolt connects to a mirror mount with a Fire Stik™ stud and SO-239 connector on a *short base-threaded aluminum rod* (e.g., I cut down a WRC threaded extender rod). At the SO-239 feedpoint, I use a Palomar Engineers™ RF choke to alleviate common mode currents and prevent the feedline from becoming part of the antenna. **Do not operate the antenna without this feedline choke**, it is imperative for optimal performance. The Chameleon™ 17' telescoping whip screws into the stud and the length is easily adjusted for band resonance in the field using an antenna analyzer.

In the bottom end cap, I drilled a 3/8" hole for a 1-1/2" x 3/8-24 bolt to connect with the Chameleon™ spike mount. I typically try to insert the spike about halfway into the ground for a stable base. In moist California soil, I can push the spike in the ground with my hand. If I am in a location with harder-packed soil, I use a rubber-head mallet to tap it in. With the spike and mirror mount, the feedpoint is up about 52" off the ground.

PVC Top Cap with Mirror Mount / Stud and Bottom Cap for Spike Mount

Elevated Tuned Linked Radial System Using Spade Connectors

The performance advantages of the PERformer are the **elevated 52" feedpoint** and the **two elevated tuned radials placed 90° apart** providing good **directional gain** (**+0.31 dBi**, **3.37 dB** front-to-back) within the span of the radials. Make sure span compass points are selected in the direction desired for extra gain. On the west coast, I place them north and east for great results across the continent.

When I initially modeled the antenna in 4NEC2, I input many different **radial spans** from 10° to 120° apart to determine how the span impacted gain and directionality. Ultimately, the optimal span was computed to be at **90°**. As mentioned previously, placing the radials **180°** apart (opposite each other) provides a balanced *omnidirectional* pattern.

I also modeled different **numbers of elevated radials** to determine what quantity provided the best performance. I concluded that any incremental number of elevated radials beyond **two** provided very little benefit and just added to the components to carry with the antenna. Furthermore, **two elevated radials provide more antenna gain, efficiency and improved SWR over just one radial**.

When I constructed my early antenna prototype five years ago, I cut an individual pair of radials for each of the six bands (20M-6M) for model evaluation and optimization. Once I was satisfied with the results, I replaced the six pairs of radials with just **one linked pair** that included embedded **spade connectors** for each **incremental band segment**. This reduced the amount of wire I had to carry with the antenna.

Original Six Pairs of Radials (left) Replaced by One Pair (center) with Spade Connectors

I pack the single pair of radials with a Wolf River Coils™ Sporty Forty (for 40M band operation) in a zippered clear plastic travel bag commonly used for travel toiletries. These bags are fantastic to carry any portable antenna essentials. They are made of thick clear plastic and are water resistant. I have several of them to neatly organize all kinds of components.

On the following two pages, more detail on the **lengths** and **construction of the linked radial system** is provided. For this radial pair, I use one Mueller™ clip to combine and connect the two elevated radials at one end to the mirror mount base, and a Mueller™ clip at the ends of *each* elevated radial to attach to the fiberglass stakes.

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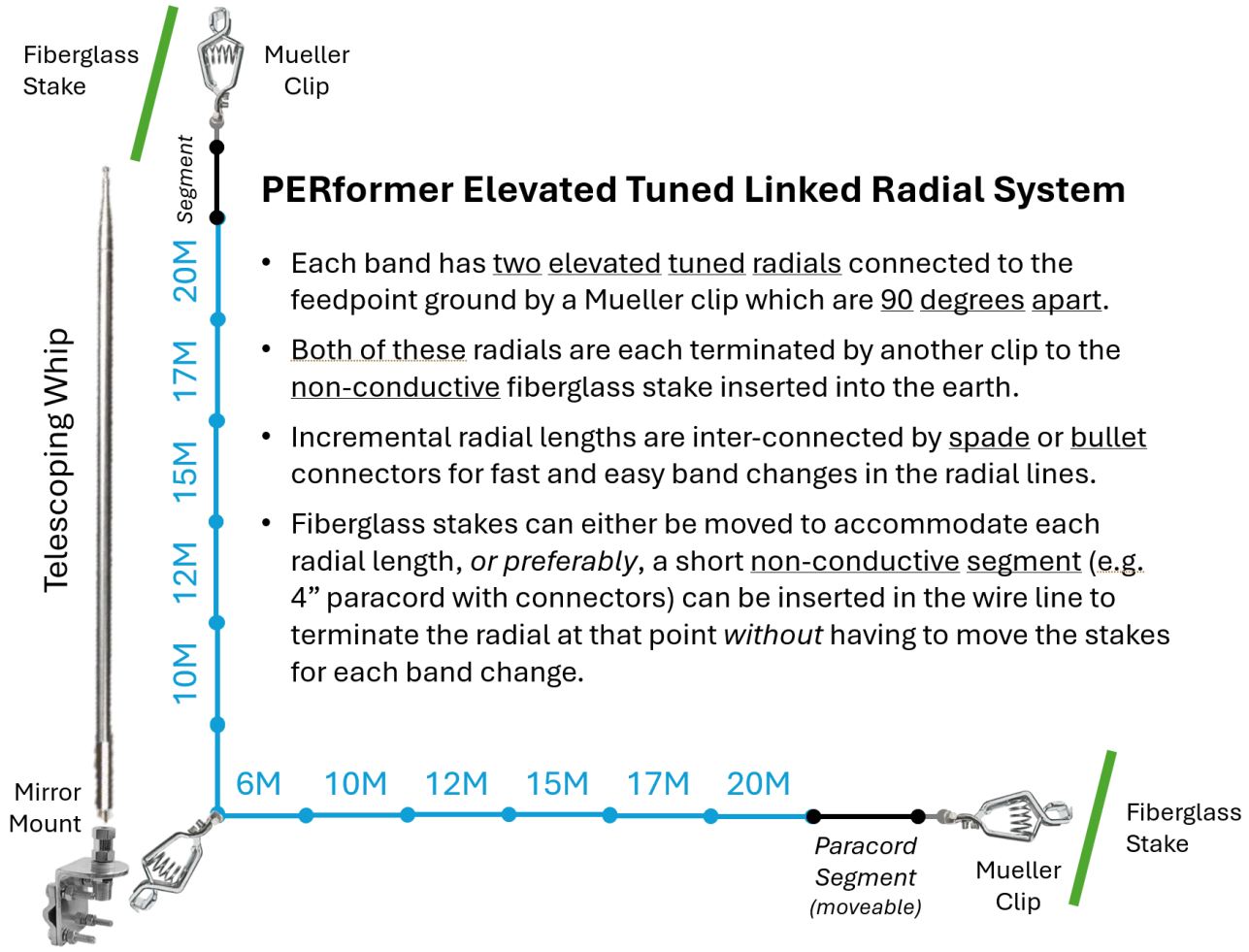
Antenna Configuration and Elevated Tuned Linked Radial System



PERformer Elevated Tuned Linked Radial System

- Each band has two elevated tuned radials connected to the feedpoint ground by a Mueller clip which are 90 degrees apart.
- Both of these radials are each terminated by another clip to the non-conductive fiberglass stake inserted into the earth.
- Incremental radial lengths are inter-connected by spade or bullet connectors for fast and easy band changes in the radial lines.
- Fiberglass stakes can either be moved to accommodate each radial length, *or preferably*, a short non-conductive segment (e.g. 4" paracord with connectors) can be inserted in the wire line to terminate the radial at that point *without* having to move the stakes for each band change.

Elevated Tuned Linked Radial Implementation

- When a short non-conductive paracord segment is inserted within each radial line at the appropriate point for the desired band of operation, the total length of each elevated radial is:

Band / Length	Description of Total Radial Length
6M = **43"**	**1.5"** feedpoint clip + **41.5"** 6M radial segment
10M = **80"**	**43"** 6M radial length + **37"** 10M radial segment
12M = **96"**	**80"** 10M radial length + **16"** 12M radial segment
15M = **120"**	**96"** 12M radial length + **24"** 15M radial segment
17M = **149"**	**120"** 15M radial length + **29"** 17M radial segment
20M = **198"**	**149"** 17M radial length + **49"** 20M radial segment

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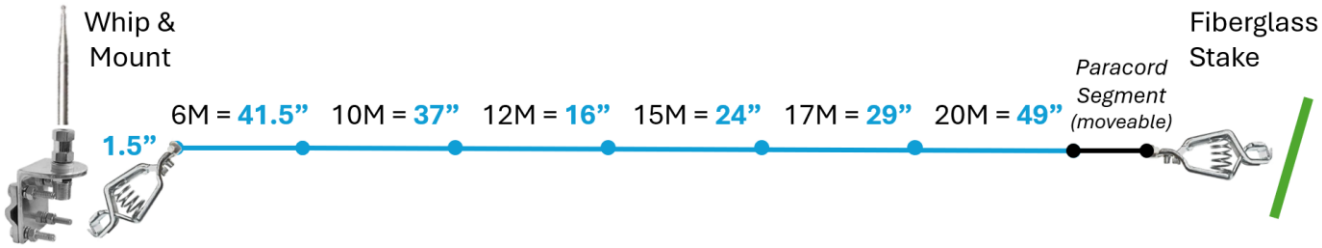
Incremental Wire Segment Lengths for Each Band in the Radial Pair



To construct the linked radial system, cut a 6M pair with **41.5"** of wire (considering the **1.5"** Mueller™ clip = **43"** total) and attach the Wirefy™ connectors. Next, cut pairs of *incremental* wire segments for each of the other five bands and attach connectors. I like Wirefy™ spade connectors because you *tightly crimp* the wire within the *heat shrink tubing*. Once heated, the tubing shrinks, and it also includes *internal glue* for a very secure fit.

Once all the *incremental* sections are cut, connect all the six band segments together in a single string to make a **198"** 20M radial. Insert the *non-conductive segment* at the end and attach to a Mueller™ clip and female connector. Make sure the band segments are all connected in *correct order*: 6M, 10M, 12M, 15M, 17M and 20M. It is important to label each band segment. I use a Brother™ label folded over itself on each wire segment.

Wirefy™ Connectors/Tool, Linked Radial Pair, Non-Conductive Inserts

To **change bands in the field**, both the length of the telescoping whip and the two elevated radials must be adjusted. To adjust the radial lengths, there are two options:

1. **Add or remove a radial wire segment** for the desired band and relocate the fiberglass stakes to ensure the elevated radials remain taut. This requires the end stakes to be pulled out of the ground and moved to new positions for each band change (*not ideal, but it works fine*).
2. A *faster and simpler* way is to **insert a *non-conductive* segment** between the band wire segments terminating the radial at that point for the desired band. I created this by cutting two **4" lengths of paracord** that were thin enough to fit the Wirefy™ connectors. By doing so, the fiberglass stakes *do not* need to be relocated for each band change. When the antenna is initially deployed, extend the two elevated radials fully taut with all band wire segments. Once extended with the stakes, insert the two non-conductive segments *after* the band segment desired. For example, if you want 15M, insert the non-conductive segments between the 15M and 17M wire segments. For 20M, insert the non-conductive segments between the 20M wire segments and the endpoint Mueller clips.

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Backpack Portable Version

The PERformer has been a fantastic portable antenna system for my picnic table POTA activations, typically running QRO 100 watts.

However, a couple years ago, I purchased the **ICOM IC-705** QRP transceiver with the **ICOM backpack** for ultra-portable operations. The IC-705 and backpack have been a great *catalyst* for me to explore more remote park sites and learn to appreciate the *wonderful world* of QRP 10 watts SSB.

To redesign the PERformer for more portability, I developed some modifications of the antenna system to facilitate a compact version that will easily fit in the *side pocket* of the ICOM backpack without sacrificing performance.

The side pocket easily carries two shortened fiberglass end stakes for radial elevation, two narrower PVC tube halves with a coupler on one, the Chameleon™ 17' telescoping whip and ground spike. Depending on the ground conditions of the deployment site, the WRC™ Megapod small tripod can be used instead of the ground spike. The antenna system remains very stable.

Additionally, I carry a Comet™ Antenna SBB-2 black mobile antenna for 2M/70 cm band coverage on the IC-705. The Comet™ is a well-designed compact 18" dual-band antenna that operates as a quarterwave for 2M (+2.15 dBi) and a 5/8-wave antenna for 70 cm (+3.8 dBi). It can handle up to 60 watts.

The backpack side pocket easily holds the Chameleon™ 17' whip and ground spike. I also cut a 40" PVC tube (3/4" O.D.) in half and glued a coupler on one end. The two fiberglass end stakes are cut down to 3' long.

I slide the Chameleon™17' whip in one half of the tube, and the ground spike in the other. I wrap a Velcro™ strap around the two halves with the two fiberglass end stakes to hold the items securely.

A clear plastic toiletry bag holds a Sporty Forty for 40M, as well as the linked radials. This bag, along with a RigExpert™ Stick and a mirror mount for the top of the PVC tube, all easily fit in the front zippered compartment of the backpack.

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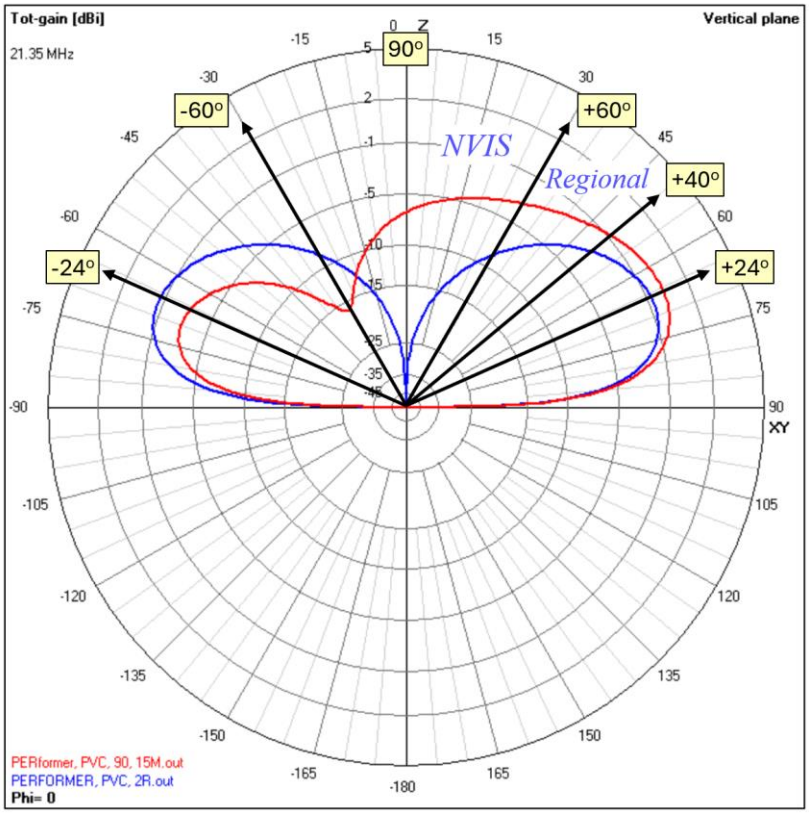
Comparing the PERformer with Radial Spans at 90° *Directional* and 180° *Omnidirectional*

One of the interesting features of the PERformer is that the radials can provide *directionality* at a 90° span but can also be made *omnidirectional* with a 180° span (*opposite* each other). This benefits those deployments where you want to radiate evenly in all directions (e.g., center of the country). Note in the **15M far field radiation graphic** below, the radial span at 90° is in red and the span at 180° is in blue.



The **90° radial span** provides **+0.98 dB more forward gain** at **+24° elevation,** **+2.36 dB more angled gain** at *forward* **regional angles** around **+40° elevation,** and **+5.27 dB more upward gain** at *forward* **NVIS angles** beginning at **+60° elevation**. However, the **90° radial span** creates a **null at -60°** for weaker *rear* regional and NVIS coverage but has a **3.37 dB front-to-back** at **-24°** for directionality.

Elevation off Horizon	**90° Span** (*directional*)	**180° Span** (*omni*)	*Delta*
+24° ***Forward***	+0.31 dBi ✓	-0.67 dBi	***+0.98 dB***
+40° *Regional*	-0.31 dBi ✓	-2.67 dBi	***+2.36 dB***
+60° *NVIS*	-3.26 dBi ✓	-8.53 dBi	***+5.27 dB***
-24° ***Rear***	-3.09 dBi	-0.67 dBi ✓	***+2.42 dB***

- Directional configuration provides **3.37 dB front-to-back** at 24° elevation
- Radial span *does not* impact antenna **radiation efficiency** of **90.4%**

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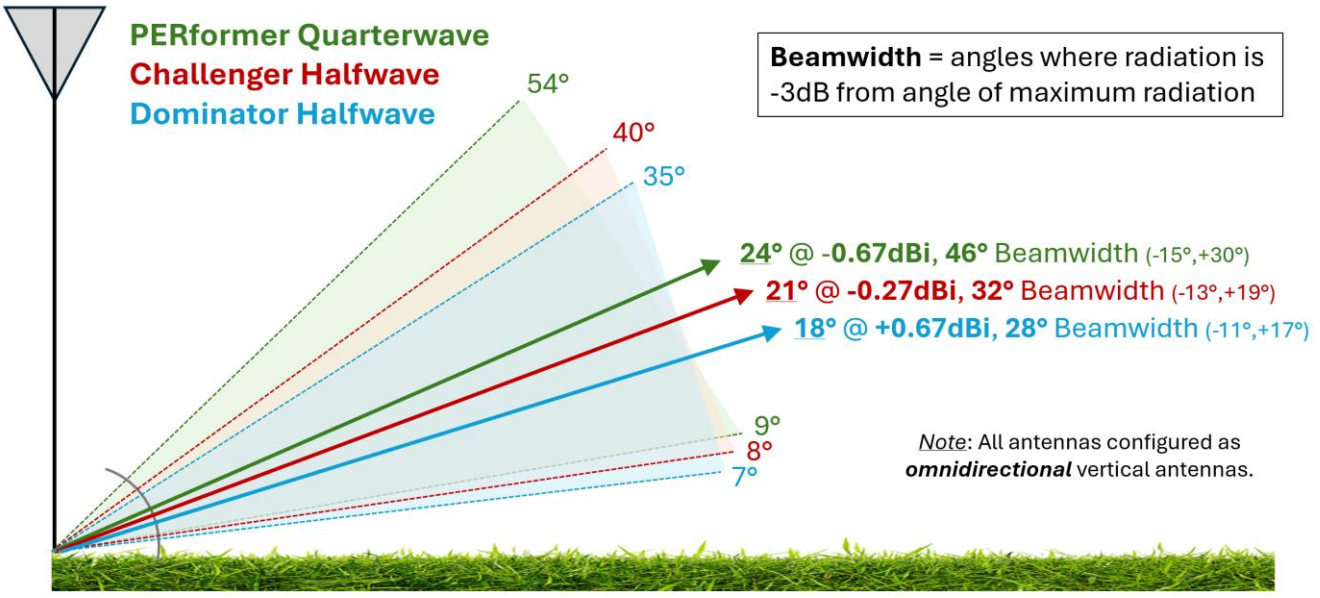
Comparing the PERformer Quarterwave, Challenger Halfwave and Dominator Halfwave Antennas

I designed three portable vertical antennas because each has their own **best use case**. The **PERformer** quarterwave is optimal for *regional* to *continental* coverage, the **Challenger** off center-fed halfwave is optimal for *continental* to *global* coverage, while the **Dominator** end-fed halfwave vertical is optimal for *cross-continental* and *global DX* coverage. All antennas provide high structural antenna efficiency.

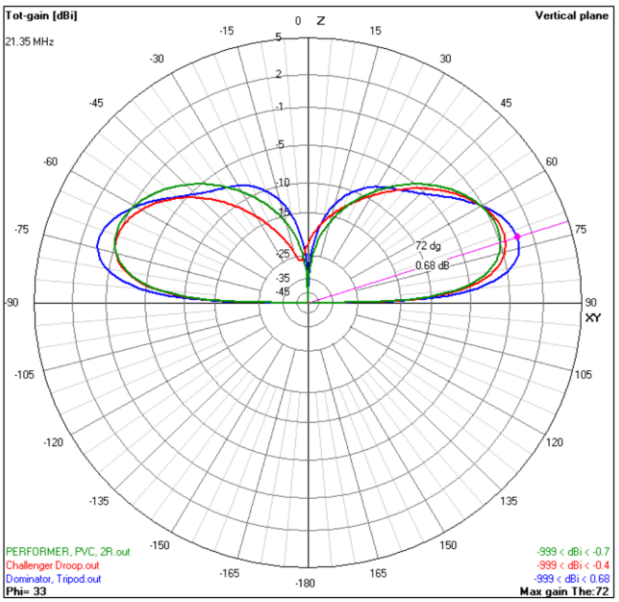
Specifications	PERformer	Challenger	Dominator
Vertical Wavelength	• **Quarterwave**	• **Halfwave**	• **Halfwave**
Antenna Configuration	• Omnidirectional • 2 Elevated Tuned Linked Radials 180° apart	• Omnidirectional • 1 Linked Counterpoise, ~10% λ per band	• Omnidirectional • 1 Linked Counterpoise, ~33% λ per band
Band Coverage	• **40M-6M**	• **20M-6M**	• **17M-10M**
Structural Efficiency	• 90.8%	• 94.3%	• 99.5%
50Ω Impedance Match	• ---	• **4:1 Unun** *Off-Center Fed*	• **49/56:1 Xformer** *End-Fed*
Key Component Loss	• -0.12 dB *(toroid choke only)*	• -0.46 → -0.35 dB	• -1.08 → -0.51 dB
Peak Radiation	• **-0.67 dBi**	• **-0.27 dBi**	• **+0.67 dBi**
Angle of Peak Radiation (-3 dB BW)	• **24°** (9° *to* 54°)	• **21°** (8° *to* 40°)	• **18°** (7° *to* 35°)
-3.00 dB Beamwidth	• **46°** (-15°, +30°)	• **32°** (-13°, +19°)	• **28°** (-11°,+17°)
Primary Reach	• Regional, Continental	• Continental, Global	• Global

The *primary reach* of these three antennas results from **angle of peak radiation**, **strength of peak radiation**, and the **-3 dB radiation beamwidth**. The graphic below demonstrates how unique each of the antennas are in these characteristics. The **Challenger** peak radiation of **-0.27 dBi** is at an angle ***3° lower*** than the **PERformer**, while the **Dominator** peak radiation of **+0.67 dBi** is at an angle ***3° lower*** than the **Challenger**! Among all three antennas, the **Dominator** has the most concentrated and narrowest -3 dB beamwidth of only ***28°*** radiating at ***18°*** above the horizon for fantastic DX when the conditions are right.

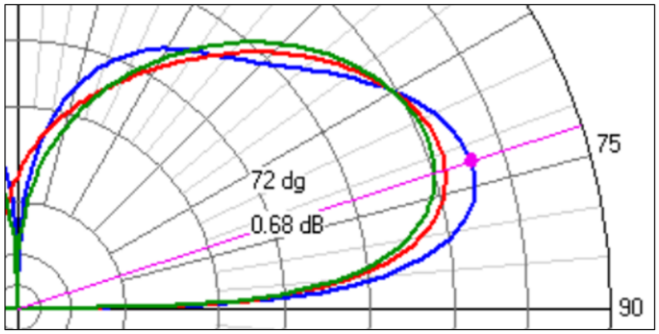


PERformer (Portable, Elevated, Resonant) Antenna by KJ6ER

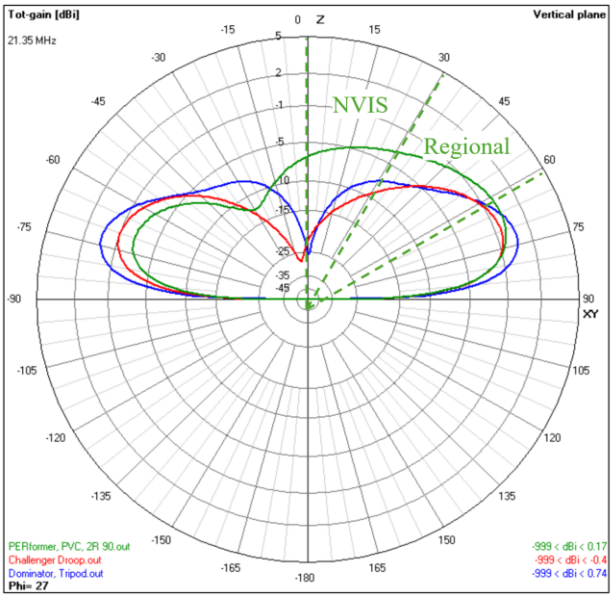
When looking at the *far field* *omnidirectional* *radiation patterns* of all three antennas overlayed, the **Dominator** provides the strongest radiation **below 30°** off the horizon, while the **PERformer** provides the strongest radiation **between 30° and 60°** off the horizon for regional coverage. The **Challenger** fits perfectly in between the other two antennas with the most balanced *omnidirectional* radiation.



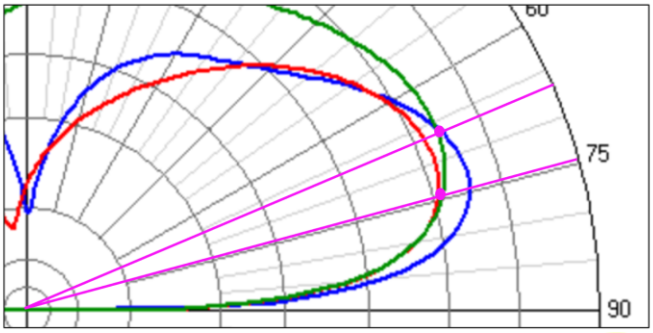
- Looking at the ***far field*** **radiation patterns** of all three antennas on **15M** (21.350 MHz): **PERformer** quarterwave, **Challenger** halfwave and **Dominator** halfwave.
- Comparing **radiated gain** at **18°** off the horizon: **Dominator: +0.68 dBi**, **Challenger: -0.32 dBi**, **PERformer: -1.00 dBi**.



When looking at the *far field radiation patterns* with the **PERformer** in its *directional* configuration, note how its radiation exceeds the **Challenger** at **16°** off the horizon and ultimately exceeds the **Dominator** at **23°** degrees off the horizon. This is what makes the *directional* **PERformer** so popular among portable POTA operators! As expected, in that *directional* configuration, both the *omnidirectional* **Challenger** and **Dominator** significantly exceed the **PERformer** radiation on the backside. As mentioned earlier, each antenna has its own **best use case** and is very effective based upon the communication goals.



- Looking at the ***far field*** **radiation patterns** of all three antennas on **15M** (21.350 MHz): **PERformer** Directional Radial Span, **Challenger** halfwave and **Dominator** halfwave.
- Comparing **radiated gain, PERformer** *exceeds* **Challenger** @ **16°** off the horizon and *exceeds* **Dominator** @ **23°** off the horizon.



Final Comments

The PERformer is an efficient quarterwave vertical antenna and I strongly encourage you to try your own implementation in the field. My elevated tuned linked radial system has performed extremely well. I am able to change bands by easily inserting the short non-conductive segment between the appropriate band wire segments and then adjusting the whip to resonance. Band changes take *less than a minute*.

As with my **Challenger halfwave** and **Dominator halfwave vertical antennas**, this antenna deploys very fast. I can get the PERformer up and running with the elevated radials in a couple minutes. And when it is time to leave, the antenna is fast and easy to pack up. For me, a key feature of a portable antenna is not only its performance, but the *elegance* of its design and deployment.

As I mentioned earlier, each of my vertical antennas has its own **best use case**. Depending upon the operational objective, I always have these antennas ready to deploy. You may want to consider building all three antennas and keeping them ready in your *portable antenna portfolio*.

All Three Antennas	PERformer Quarterwave (40M-6M)	Challenger OCF Halfwave (20M-6M)	Dominator EF Halfwave (17M-10M)
• 90%+ structural efficiency • Less than 5 minutes deployment • Easy to pack and transport	• 40M resonance unlike other two antennas • Directional option with 3 dB+ f-to-b • Best antenna for 30°-60° *regional* coverage	• 94%+ highest radiation efficiency • 20M and 6M halfwave resonance • Best antenna for *balanced* coverage	• 18° lowest angle of radiation • Strongest maximum radiation of +0.67 dBi • Best antenna for 5°-20° *global* coverage

The **PERformer** could also be used at your home QTH, especially in a neighborhood with antenna restrictions. Keep in mind, you will have to adjust the telescoping whip length and the set of tuned radials for the band you want to operate on. For an HOA, the advantages of the PERformer are that it is fast and easy to deploy when you want to use it. Then you can take it down quickly until you want to operate again.

One of my favorite parts of HAM radio is experimentation – especially with portable antennas. Give it a try and have some fun!

Please let me know if you have any questions, I'd be happy to help, 73! 😊

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