# POTA PERformer (Portable, Elevated, Resonant) Antenna

## Introduction

The **POTA PERformer (Portable, Elevated, Resonant)** is an elevated vertical antenna for 40M-6M sitting on a tripod (or an extended ground spike) with the feed point about 5-6' off the ground and two elevated tuned radials. This is a fantastic portable antenna – easy to pack, fast to deploy, very effective and highly efficient. And it is simple for you to build and deploy yourself!

I have computer modeled the antenna extensively in 4NEC2 (including the tripod) and calculated optimal whip and elevated tuned radial lengths. You will have to experiment in your own surroundings to finetune these, but I typically get better than 1.1:1 SWR on all bands. I have found through my modeling and real experience in the field, this elevated vertical is more efficient than any ground-mounted version I have ever used!

You can certainly deploy this type of portable antenna for 40M with a coil (like the WRC Sport Forty) and get similar results but elevating two 33' radials is a bit cumbersome in the field. Alternatively, you can combine the two 20M 16.5' radials end-to-end with two fiberglass rods to have one elevated 33' 40M radial (that is what I do on POTA activations).

## Elevated Tuned Radials

The two elevated tuned radials are 90 degrees apart to provide some directionality within the 90-degree span (about 6-12dB or up to 2 S-units). If you prefer an omnidirectional radiation pattern, you can simply place the two elevated radials 180 degrees apart.

Having your tuned radials elevated dramatically reduces near-field ground losses and increases gain versus a purely ground-mounted vertical with ground-coupled radials. I regularly get comments like "*you're the loudest signal on the band*" from hunters. It is also a great DX antenna when conditions are right with a very low angle of radiation component around 12-15 degrees.

## Antenna System Parts List

Here are the components I use for the **POTA PERformer** (you can substitute as you wish):

- Chameleon™ 17' telescoping whip – https://chameleonantenna.com/shop-here/ols/products/cha-ss17
- Aluminum tripod to get feed point up 5' – https://amazon.com/dp/B09FCMS3DP
- Aluminum tubing 1" OD x 2' inserted into tripod – https://amazon.com/dp/B014GXMT7S
- Rubber cap 1" for top of aluminum tubing – https://amazon.com/dp/B07FMFJT5D
- Mirror mount with 3/8x24 to SO-239 stud – https://amazon.com/dp/B01G2QSNDG
- Bright orange 18 AWG radials – https://amazon.com/dp/B01MPZJOYN
- 20A Mueller clips on each end of radials – https://amazon.com/dp/B00LPP8BJQ
- Fiberglass 3' rods to elevate radials – https://amazon.com/dp/B08Q346VJN

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## Computer Model Calculations and Graphics

Below are the 4NEC2 computer model calculations for the 40M-6M bands. Note that the Chameleon™ telescoping whip only extends to 205" or 17.1' max. But if you insert a coil at the base of the whip, you can operate on 40M or 30M to compensate for the shorter whip length (and provide an equivalent electrical length).

**Table 1:** 4NEC2 Computer Model Calculations for the 40M-6M Bands.

| Band | Model Freq | Calc Whip Length | Model Whip Length | Whip Length (ft) | Model vs. Calc | Radial Length (in) | Radial Length (ft) | Radial vs. Vertical Length | Radial End Height | SWR | Ref Coeff |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40M | 7.250 | 387.31 | 399 | 33.3 | 3.0% | 396 | 33.0 | 99.2% | 21.1 | 1.00 | -48.3 |
| 30M | 10.125 | 277.33 | 287 | 23.9 | 3.5% | 282 | 23.5 | 98.3% | 20.2 | 1.00 | -54.2 |
| 20M | 14.250 | 197.05 | 205 | 17.1 | 4.0% | 198 | 16.5 | 96.6% | 19.5 | 1.00 | -70.3 |
| 17M | 18.140 | 154.80 | 165 | 13.8 | 6.6% | 150 | 12.5 | 90.9% | 21.5 | 1.01 | -42.7 |
| 15M | 21.325 | 131.68 | 143 | 11.9 | 8.6% | 122 | 10.2 | 85.3% | 19.2 | 1.01 | -46.5 |
| 12M | 24.960 | 112.50 | 128 | 10.7 | 13.8% | 96 | 8.0 | 75.0% | 18.5 | 1.01 | -50.0 |
| 10M | 28.500 | 98.53 | 117 | 9.8 | 18.8% | 77 | 6.4 | 65.8% | 18.0 | 1.01 | -45.8 |
| 6M | 51.000 | 55.06 | 56 | 4.7 | 1.7% | 43 | 3.6 | 76.8% | 20.5 | 1.00 | -52.7 |

## Finetuning the Antenna in the Field

You can easily and quickly finetune the antenna system resonance with an analyzer by slightly adjusting the length of the whip up or down once you have attached the right set of radials for the band.

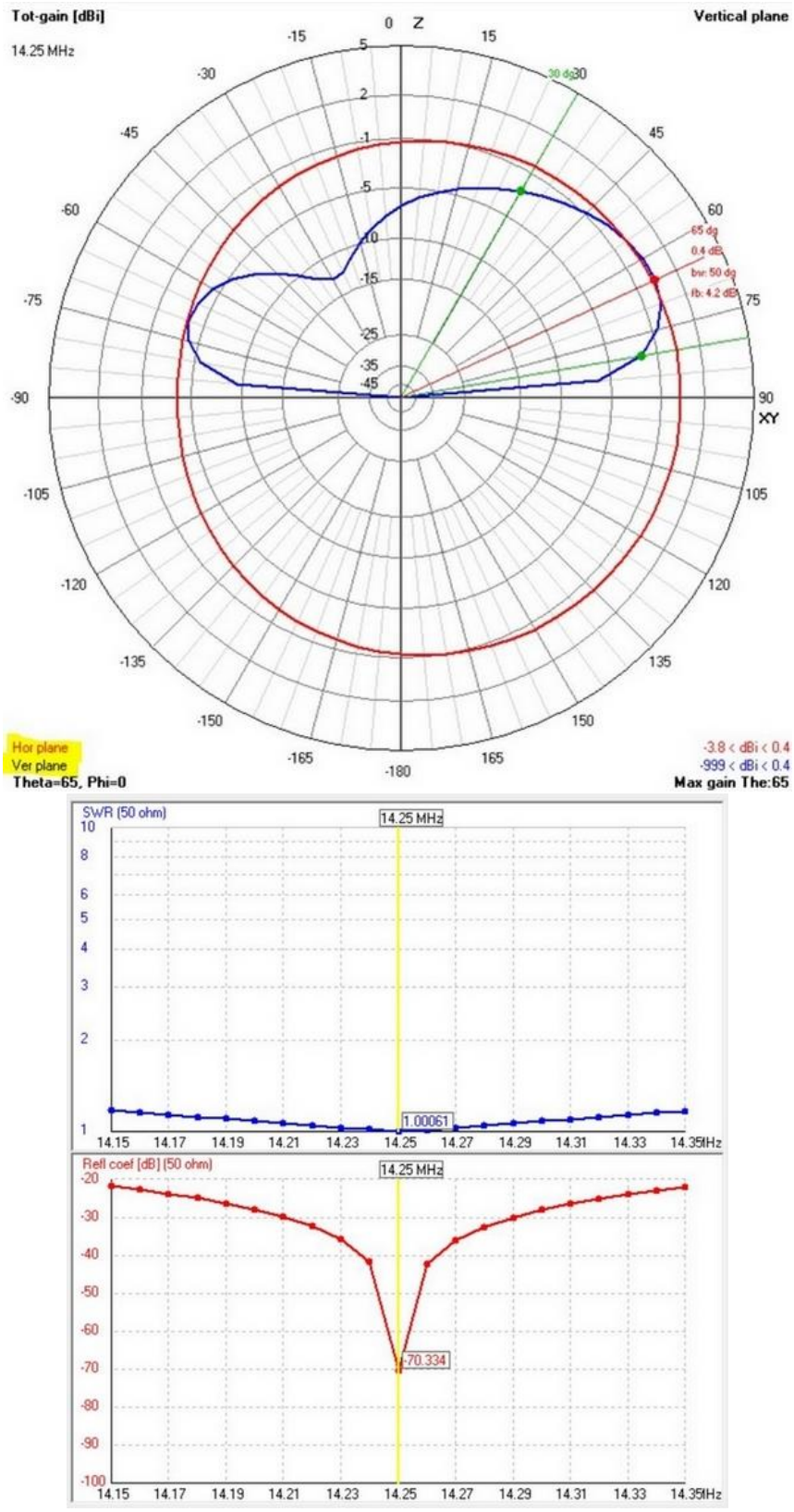
Since every portable deployment will have different surroundings and SWR impact, I recommend you remember generally where to extend the antenna initially for a particular band and then make whip adjustments from there.

For example, I have found that 10M requires only the top 4 sections of the whip extended (above the first section) and the other sections compressed. On the other hand, 20M requires all the sections extended for the full 17.1' length. The precise whip length will be likely vary at each deployment depending on the surroundings.

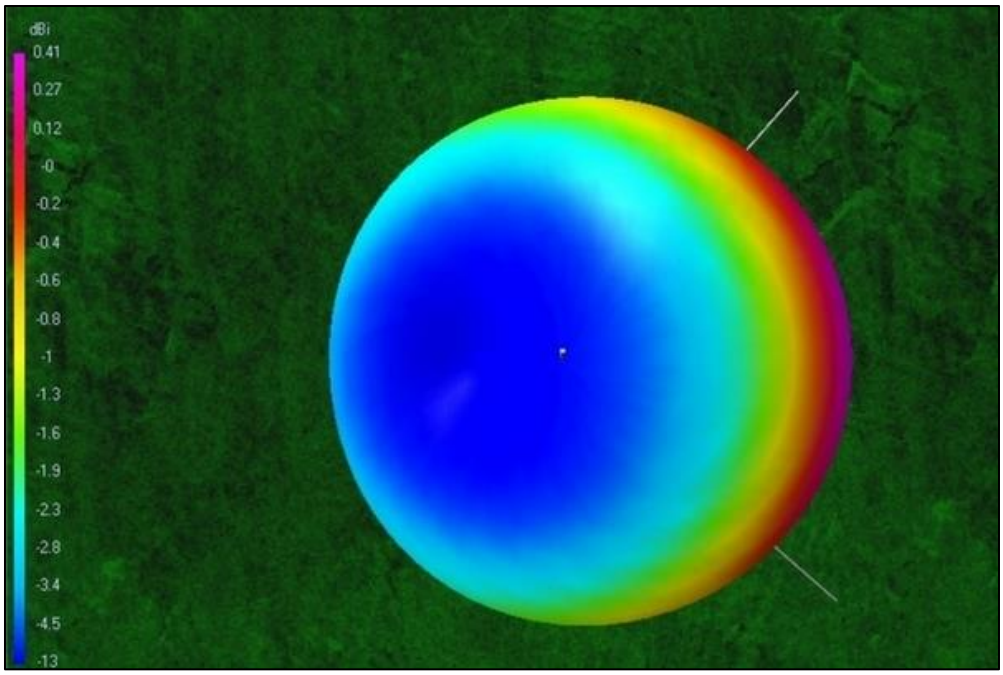
Because of the tuned resonant characteristics of the **POTA PERformer**, you should not require an external antenna tuner of any kind at your rig or at the antenna base potentially reducing any losses caused by these components (and saving on packing).

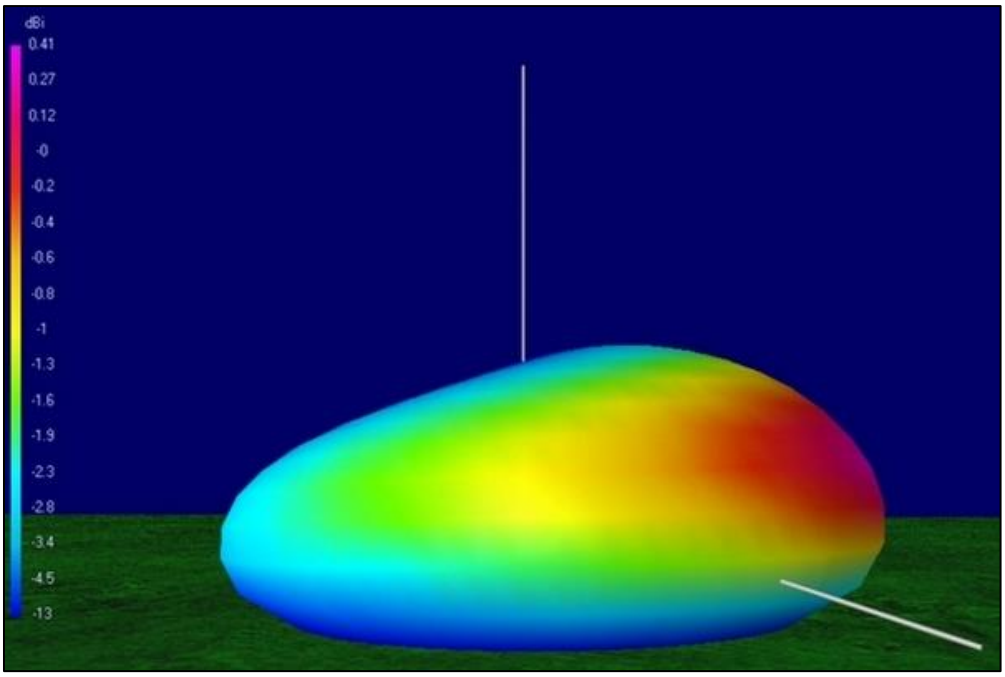
Of course, this type of resonant vertical antenna is especially effective for portable QRP operations where every bit of RF energy radiated is preserved.

**Figures 1-2:** 4NEC2 computer model graphics showing the far-field radiation pattern (vertical, horizontal planes) and reflection coefficient (RC) for 20M (14.250 MHz).



**Figures 3-4:** 4NEC2 computer model graphics showing the colorful 3D radiation patterns.




On the following two pages, you will see four photos of the **POTA PERformer** in my backyard 'antenna proving ground' to demonstrate how the tripod elevates the feedpoint up 5-6' (depending on the leg spread you choose) and how the 3' fiberglass stakes elevate the end of the two radials 90 degrees apart. I insert the radial fiberglass rods at a 60-degree angle into the ground for stability and radial tautness. Clip the radial onto the rod initially 2/3rds of the way up and, once inserted into the ground, pull it up to the top to make it tight.

**Figures 5-6:** Antenna deployment showing system configuration with radial clips.

**Figures 7-8:** Elevated radial deployment with radial clip and 20M SWR measurement.

## Final Comments

The **POTA PERformer** is my primary POTA activation quarter-wave vertical antenna and I strongly encourage you to try it in the field.

Alternatively, a version of this elevated antenna system could also be used at your home QTH. Keep in mind, you will have to keep adjusting the telescoping whip length and the set of tuned radials for the band you want to operate on. While that's easy for POTA use, it may be inconvenient for you at home. Of course, if you only want to primarily run on a single band or two (e.g., 20M and 15M), that would be easy to manage.

Incidentally, as an alternative for individually cut tuned radial wire pairs, I have constructed and used a pair of radial wires with inserted bullet connectors to add in or remove radial sections for each band. You may find this easier to deploy and slightly smaller to pack.

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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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