

A Direct and Single Feed Dual Band Vertical Dipole Array for 20 and 17 meters

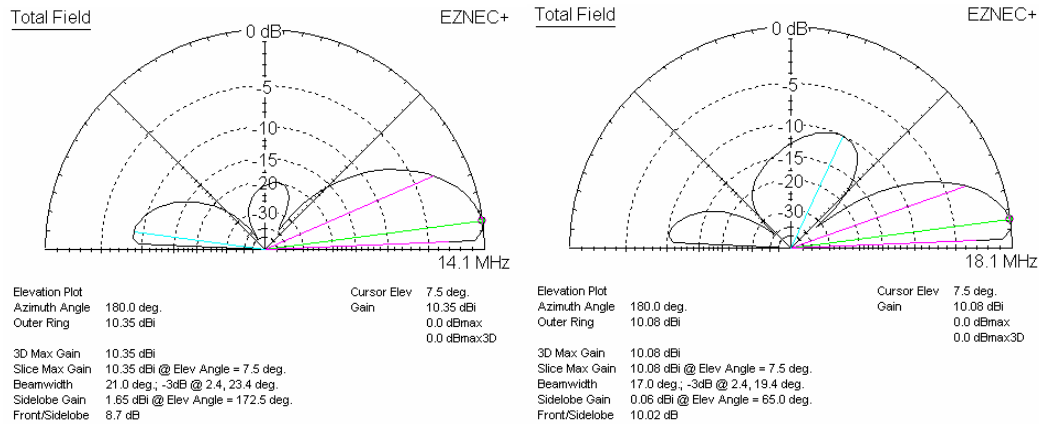
If your limited weight DXpedition will take you to an exotic land with a beach location, a popular antenna to take advantage of the salt water for low takeoff angle is the Vertical Dipole Array (VDA), usually with 2 elements. F4VKB (try google) has advocated a version which just requires a single fiberglass vertical mast with a shorter cross member that has been deployed effectively a number of times. This configuration uses slightly V shaped wire elements much like the Spiderbeam. With suitable spacing and bend angle, the impedance is in the neighborhood of 50 ohms, allowing direct feed, and it provides a gain similar to a 2 element yagi.

For my planned (and now done) DXPed to a beach as V73MW, I experimented in advance with a 20 m VDA based on F4VKB's information plus EZNEC - and it was all set. Direct feed provided good matching. The technique for tuning the antenna was to (1) first model it for a decent gain/SWR compromise by varying the lengths and spacing. Next (2) remove the reflector element from the model and calculate the "bare" resonance frequency of the driven element. Then (3) construct the antenna starting with just the driven element cut long and trim its length to the resonance in step (2). Next (4) cut the reflector element to a length in proportion to the final physical driven element using the model lengths ratio. That is $(\text{physical REF}) = (\text{physical DE}) * (\text{model REF}) / (\text{model DE})$. After determining (5) if the SWR of the full antenna is sensible, you can (6) see if the antenna has a F/B similar to that from the model by powering the antenna with a source, such as the antenna analyzer, and looking at the signal on another antenna while rotating the VDA. Better would be to measure the gain but that is hard. This has consistently worked well for me and the differences in model and actual element lengths were small in this case.

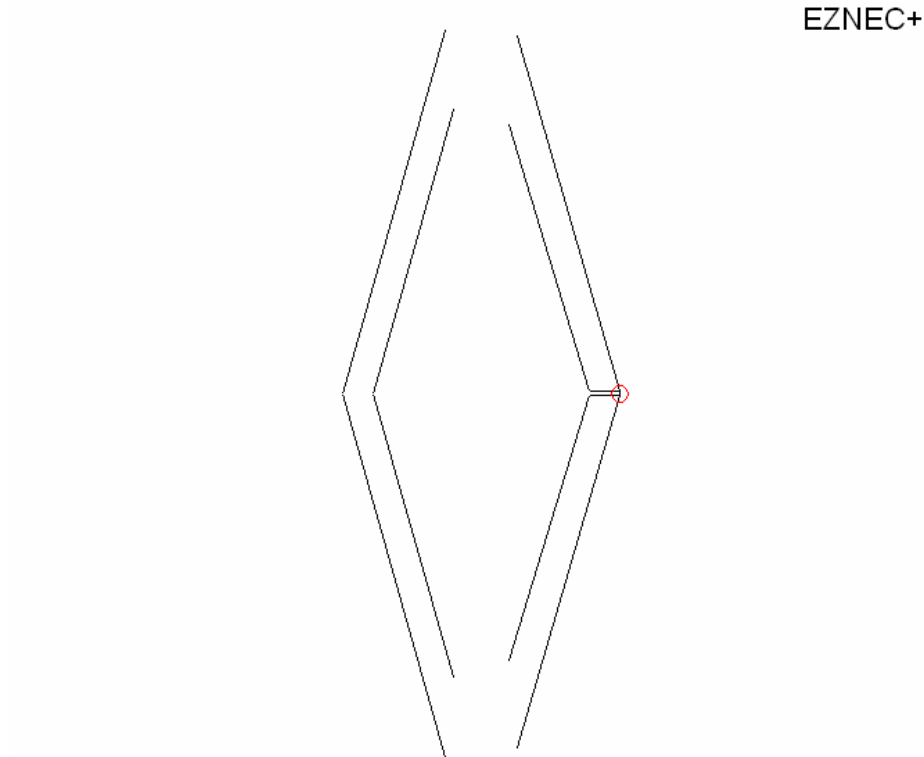
For a 20 meter VDA, a 12 meter fiberglass mast is good and the required cross member "boom," from a telescoping fishing pole in this case, is about 4 meters. Mechanically some care has to be taken to assure the boom cannot rotate about the mast. There is probably no easy way to avoid having guy ropes limit the antenna rotation.



But I wasn't done, it turned out. While not originally planning to operate on 17 m, something rude happened to make that desirable. So it occurred to me that 17 is less than 20 so the same support needed for 20 m would work for 17 as an add-on. And furthermore, the boys at Spiderbeam do multiple bands with a single feed – SO why not see if I can add 17m and yet have a single feedline for both 17 and 20. Using EZNEC, it is found (at least in the model after suitable fiddling) that this can be done by having a nested 17 m VDA inside the 20 m one AND the gains are largely the same as for a single VDA.



The model SWR on 20 m is still good BUT the SWR on 17m is sadly well above 2 even after fiddling with the 17 m dimensions in the model. The good news is that I have a KAT500 tuner to overcome that SWR issue. So let's give it a go.



The 20 m feed point is extended inward with 2 parallel wires (a short transmission line) ~0.4 m long, which shortens the V portion of the driven element a bit. Otherwise, the 17 meter antenna is nearly a scaled version of the 20 meter one. The physical antenna was constructed.. The final SWRs were 1.5 at 14.05 and 2.4 at 18.1 after some trimming of both the driven elements. It has a similar and significant F/B on 17 m and the 20 m behavior remains nearly the same. No balun/choke was used since the performance was as expected and so the benefit to weight ratio was small.

When deployed in V7-land it looked like this. Note that the shorter second mast just on the left of the antenna mast is actually from a boat and not part of the antenna.



A closeup of the boom is here.



This antenna performed very well with over a 1000 qsos on the prime band, 20meters, mostly to Europe (before a nasty tide with winds took its toll). It was good on 17 as well.