

# THE “SATURN”

*A simple portable antenna with a big kick!*



*That's pretty much it...a long fishing pole and some wires.  
A game: .... find the small proto attached to the antenna!*

## **INTRO:**

There are many among us who use a portable set-up. Some for (island) activations and others just to get away from the city qrm. Being portable certainly is fun! Especially when you're able to work a few (dx) stations!

The “key” to do that is of course the antenna you are using. So, what could be considered to be a good antenna for portable use?

## ***WHAT IS THE BEST PORTABLE ANTENNA?***

The answer to that question is rather simple:  
Bigger is better...

What one would consider a good setup for home is often “best” for portable setups as well. The problem lies of course in the amount of energy one is willing, or can put into it. Although there are some who have large beams on “trailers”, that's hardly an option when you're activating a small island somewhere and a things like weight become a consideration.

## **WHAT DO WE NEED FROM A PORTABLE ANTENNA?**

If we do take “things” under consideration:

- Low weight  
Just imagine: to go to that special DX location you need to walk with all the materials along with you. That backpack will get heavy
- Simplicity, if it rains, gets dark, or if you are tired...you do not want to struggle with the antenna.
- If broken, can it be repaired at location?  
You're finally at your destination, and you find out one of the wires is broken...  
You need to have a back-up plan.
- Maximum efficiency.  
Of course we want “maximum gain” from the wires we take along with us.

Those are probably the “highest priority in: “needs”.

## **WHAT IS USED BY PORTABLE STATIONS?**

Most guys are using simple wire antennas. Simple antennas like:

- Bamby (1 el quad or delta loop)
- Dipole
- Vertical dipole (end fed like antron 99)
- Skypper (3el G4ZU...but already needs a relative big mast)

## **ANY OTHER OPTION?.....THE SATURN:**

This principle of the antenna is not “new”, it is already a well-known one in the “antenna world” the “technical name is Bi-square, and you will find some reference on the internet. For some reason it isn't “known” in the 11 meter community. Those who have heard of it might know it as the “Saturn”.

## **WHAT IS IT?**

As mentioned the original name is a Bi-square.

But since quite some antenna types have different names when used for 11 meter ...  
Saturn seems to be a nice option ☺.

It consists out of two wires. Both a full wave length long placed in a “square” configuration.  
Keep in mind: the TOP and BOTTUM are NOT connected to each other.

You can use the antenna without the “quarter wave matching stub” (fig2) but then it has a high impedance (+3000 ohm) an antenna tuner can solve that problem.  
Another solution is a ¼ wave matching stub. (Dimensions provided further down)

The antenna has a horizontal polarisation and it has a large figure 8 radiation pattern (see azimuth pattern)

One of the best aspects of the antenna is:

It has some serious gain over a dipole or so called “bamby” antenna (quad) and the take-off angle is rather wide providing more DX contacts!

And because you do have that figure 8 radiation pattern you do not have to switch between long or short path.

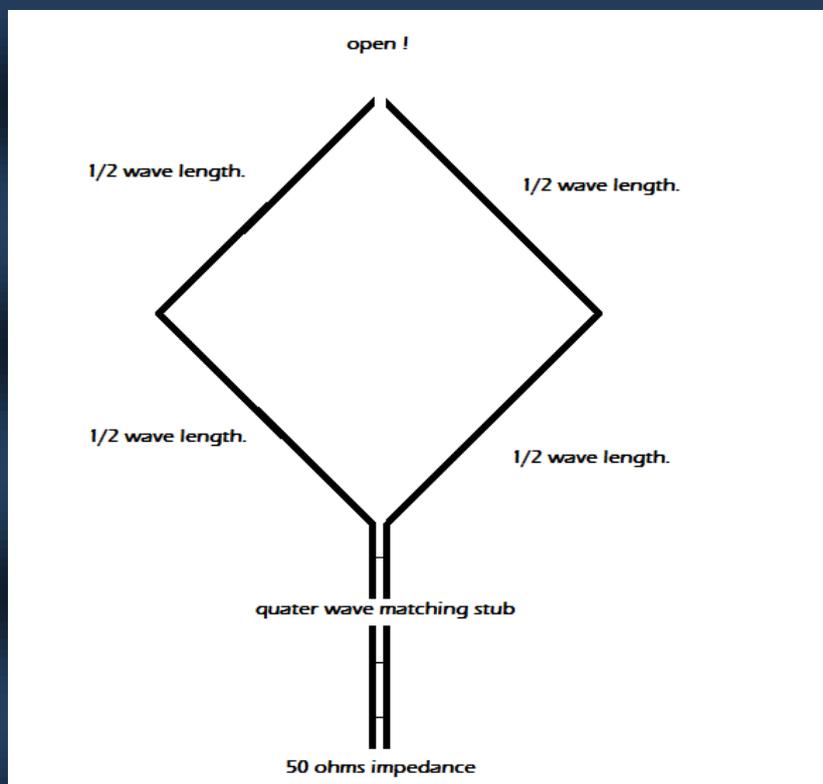
It will beat most portable setup, with rather limited time spend!

It only needs one support pole and that’s the biggest thing you need to take along with you. A 10/12 meter long fishing pole...most /P station already have one ☺

### So, why should this antenna be recommended? ”.

- 1- *It only needs one vertical pole (fishing pole)*
- 2- *It has enough wire..If it fails you can always make a dipole/quad.*
- 3- *It has some serious gain over the dipole or quad/delta loop.  
Gain is equal to a 2el yagi / small 3el*
- 4- *Weight is limited...*
- 5- *Easy to put up with one man.*
- 6- *Does long and short path at the same time. It has a large figure 8 radiation pattern.*
- 7- *No deep “nulls” in the elevation pattern.*
- 8- *Large power handling capability*

#### THE BASIC:

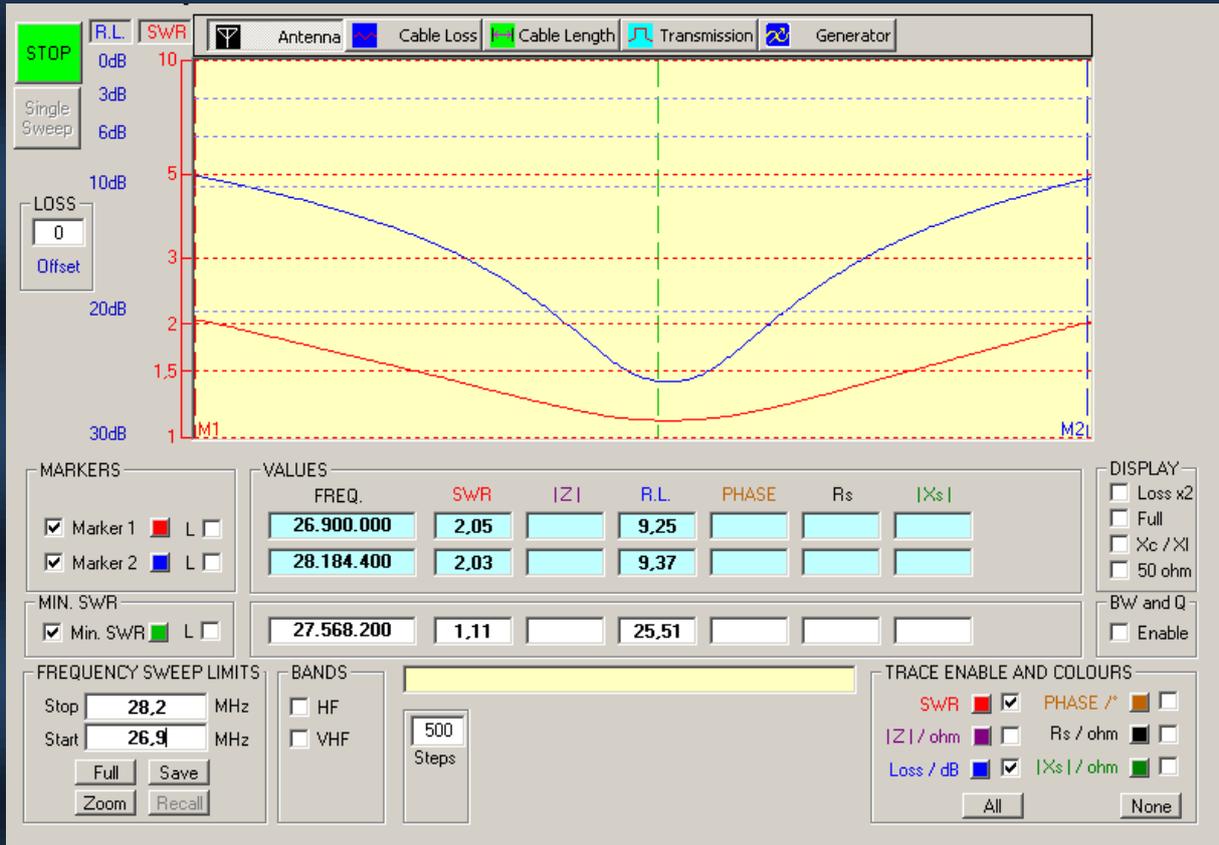




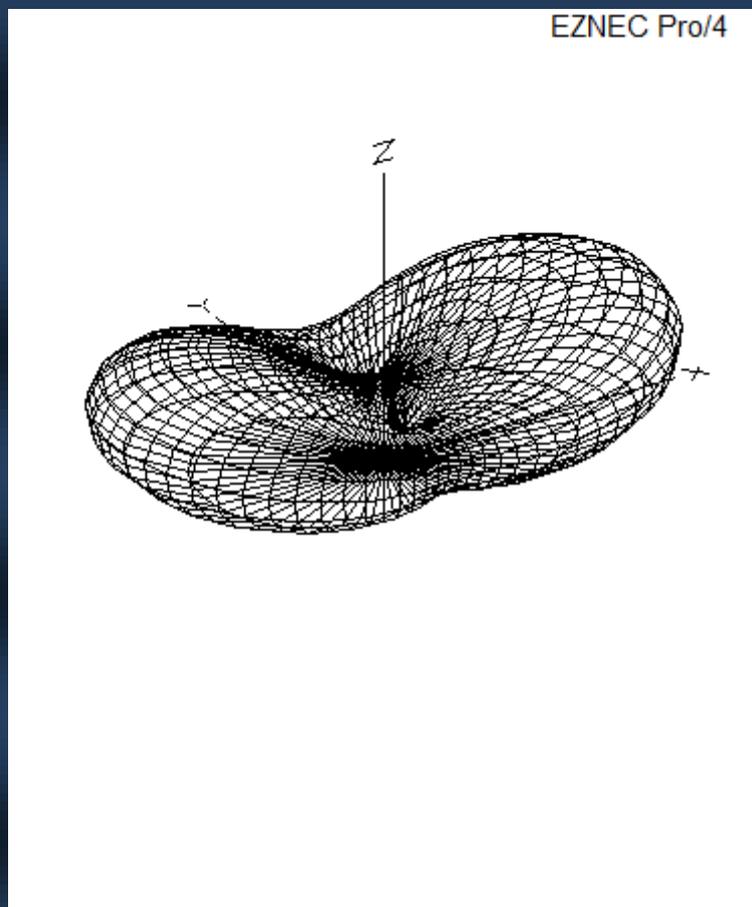
A picture of the top



And the home made open lint line (quarter wave transformer)

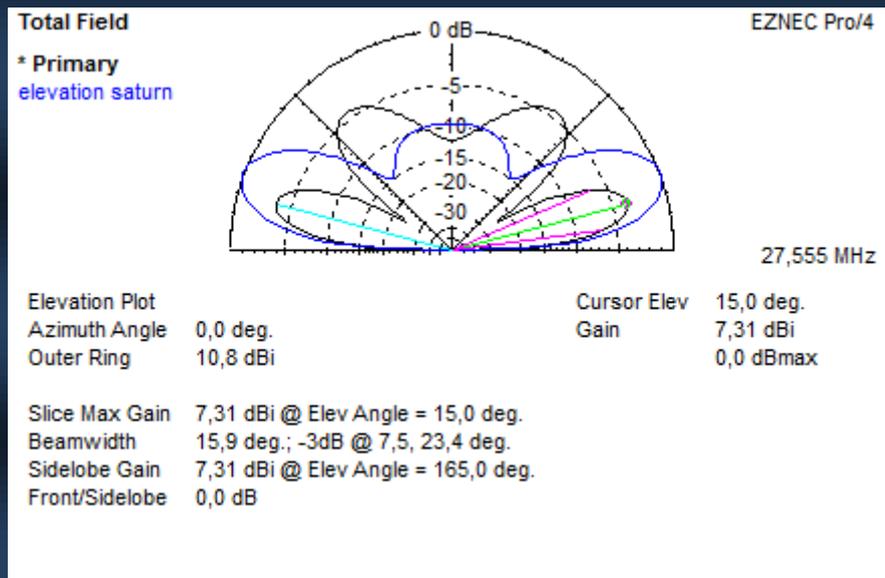


The SWR A 2:1 SWR bandwidth between 26,9 and 28.2 Mhz. (1,3 MHz)



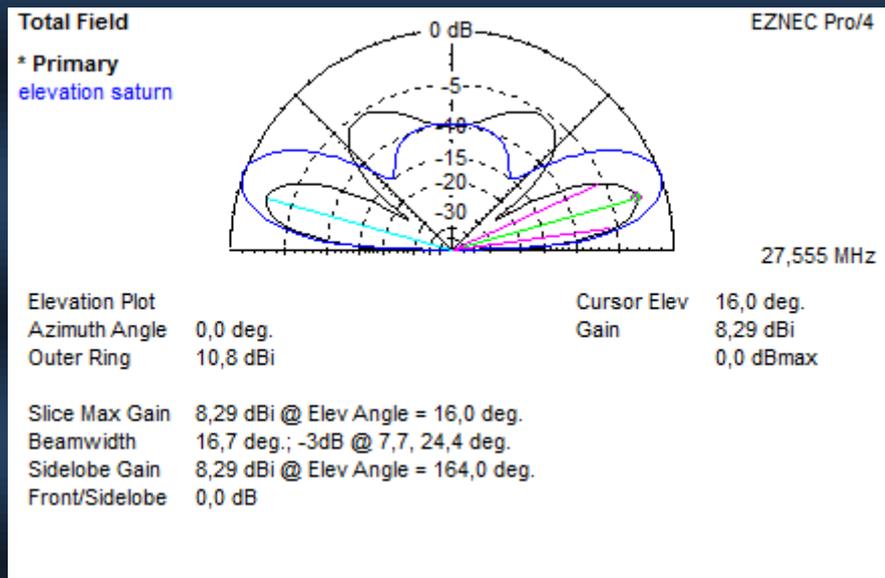
## LET'S TAKE A LOOK HOW THE ANTENNA "DOES" COMPARED TO OTHERS:

Let us compare the "Saturn" to a dipole antenna:  
Both over average ground...both horizontal polarisations



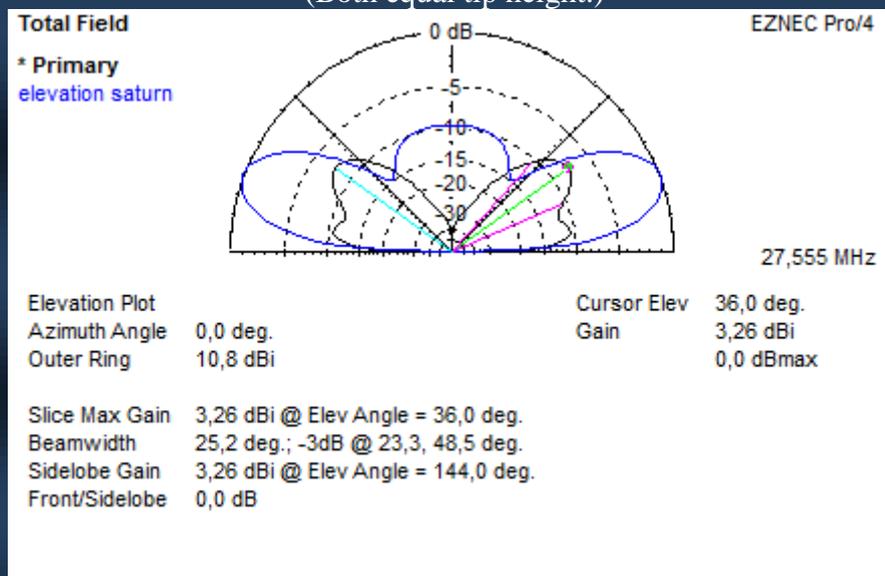
The black line indicates a dipole and the blue one the Saturn  
At 15 degrees take off angle there already is 3 to 4 dB difference!  
But more importantly ...the dipole has two lobes. The higher lobe is useless.  
The Saturn STILL HAS a large lobe of radiation there...providing up to 20 dB more gain.  
And that is where you want your angle to be! below 45 degrees.

Let us compare the "Saturn" to a "bamby" antenna.  
Both "top" height equal.



The black line indicates a 1el quad (aka bamby) the blue line the Saturn.  
 Though the gain is slightly higher compared to a dipole (1dB) the SATURN still has LARGE advantages! almost 2.to 3 dB more at its weakest point. But up to 20 dB more in some situations!

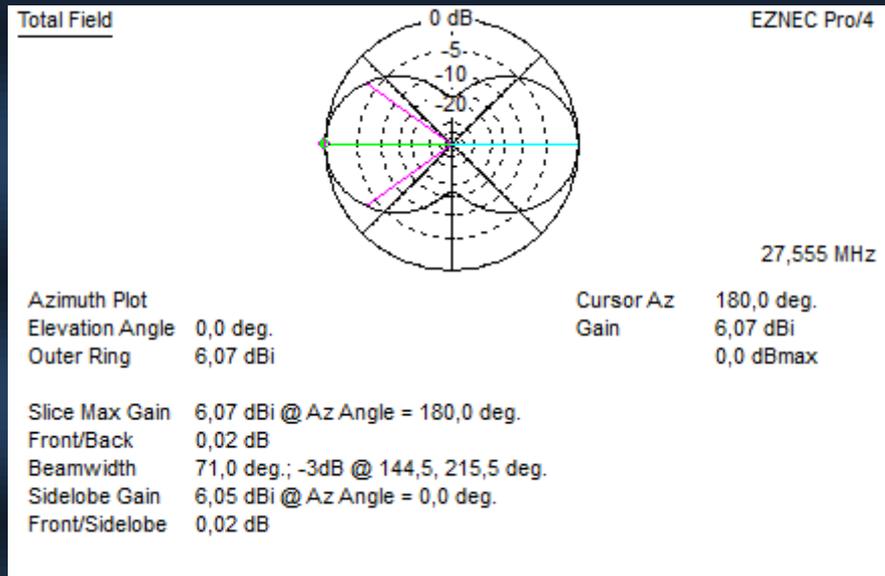
### LET US COMPARE THE "SATURN" to a Antron 99. (Both equal tip height.)



The black line indicating a 1/2 wave end fed antenna, the blue the Saturn.  
 Now that's more than 7dB GAIN advantage

I guess the score is 3-0 for the Saturn. ☺

Last but not least.....a plot of the azimuth pattern of the Saturn:



Yes, the antenna produces 6 dBi REAL GAIN...that's equal to a 2el/and small 3el Yagi !

### HOW DO WE MAKE ONE ?

Well you need to have a couple things:

- 1- A fishing pole about 12 meters long (10m or longer will do)
- 2- Electrical wire, while any "electrical wire" will do, I have used wire from <http://www.dx-wire.de/> The exact length is not really critical but roughly:  
For a halve wave you have:  
 $300/27.555 \text{ MHz} = 1 \text{ wavelength} = 10,88 \times \text{velocity factor} (0,95) = 10.34 / 2$  since we needed to have that halve wave length so were down to...5,17 meters.  
(The velocity factor of 0.95 is there cause the wire has a "coat" and is not "bare" copper wire.)
- 3- The top isolator we used can be found on that same site under "isolator" and will only cost one euro.  
If you get three of them you have a "clean" solution for the top...and the corners.
- 4- So...now we have the wire for the antenna, the mast, the isolators...but we still need to "attach" the antenna. Best would be any type of sailing rope. This cause sailing rope doesn't "held" water...water reflects...and upsets the pattern. And it won't "stretch" and can handle high tension...any type of sailing rope is the way to go! ...but for fun...any NON electrical wire will do!
- 5- The  $\frac{1}{4}$  matching section..the part that everybody is worried about.  
Well, just "cut" 10 pieces of PVC tube (6cm long) used in electrical house wiring. And drill two holes in it 4cm apart. You can put the same wire in as you have used for the antenna (make sure the holes are not too big! it must be tight)  
Make it a quarter wave length long (that's roughly 2,6 meters.)  
And "find" "the best spot for swr....  
That will take the first time a bit of work...but you should have it in 15-30 min.

AND THAT'S JUST PRITTY MUTCH IT