The Astroplane Avanti antenna was invented by Louis J. And Herbert R. Martino Blaese at the end of the sixties and patented in 1971 under registration number 3587109.

At that time CB was very fashionable, the equipment operators employed used 23 channels, and a height limitation was imposed so that the antenna could not exceed 20 feet above the maximum height of the building that existed on the property. This limitation was the Achilles heel of the vertical antennas Avanti sold that were 1/4 and 5/8 wavelength, and usually fed at the base. The reason was simple. The Avanti Astroplane antenna emits from the top, the other antennas cited do it nearer the base. This result was whenthe Avanti Astroplane, and the other verticals were mounted at the maximum permitted height of 20 feet, the Astroplane had more coverage to radiate from a greater height.

The Avanti in Figure 1 left shows three sections of 1/4 wavelength. At 27 MHz the wavelength is 11 meters, so that 3/4 wave require 8.27 meters, or 27 feet, and this exceeds the maximum height of 20 feet allowed when muntedon a building.

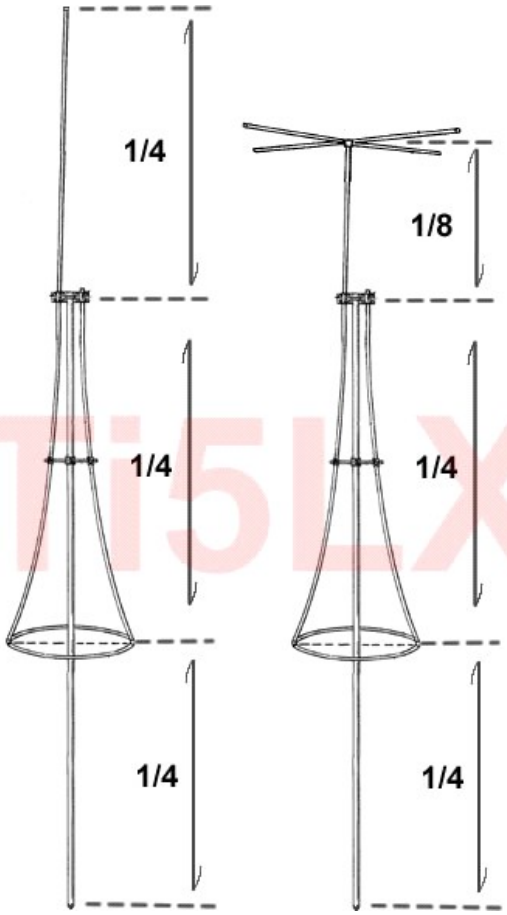


Figure 1. Original concept

The solution that Martino found was to cut the physical length of the element about 1/8 wavelength. The result was the antenna would have two lower sections of 1/4 wavelength, and an upper 1/8, as shown in Figure 1 right , reaching a height of 6.82 meters. With the shortening, due to the shape of the antenna and the type of material used, the Astroplane would perfectly meet the standard maximum height of 20 feet above a structure.

To shorten the antenna Martino employed a well known system called top loading, see Figures 2 and 3. The upper load electrically lengthened the allowed upper element of 1/8 wavelength to 1/4 wavelength. This means that although this element physically measured 1/8 wavelength, because of the top loading, the upper section had a electrical equivalent of 1/4 wavelength. How much longer? It depends on the dimensions of the top load. In this case the load elements of the crossed Capacitor Hat are constructed of 1/8 wavelength radials, and resulted in the 1/8 element achieving an electrical length of 1/4 wave. See Figure 4.

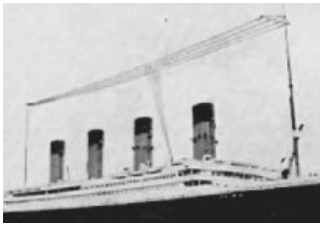
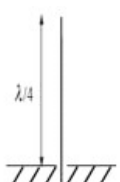


Figure 2. T higher load on the antenna used Titanic



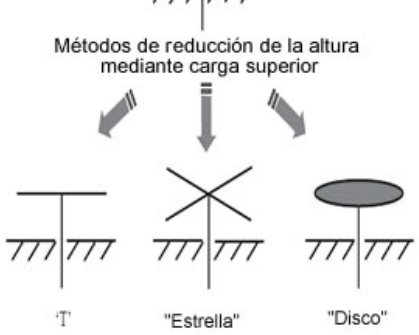


Figure 3. Higher load types for antennas

Figure 4 shows two antennas Avanti to 2 meters. On the left a simple antenna uncharged upper right has placed a mirror, using this analogy to show how the top tube length is extended. This is about the effect of the cross (top load) Astroplane Avanti antenna for purposes of radio waves form a mirror which extends above.

Figure 4. Analogy of elongation of an antenna by higher load.

The antenna patented in 1971 is shown in Figure 5, consists of an upper 1/8 wavelength, at the end of which a load is placed on cross-shaped elements 4 made up of 1/16 of length wave.

The middle part of the antenna elements consists of two 1/4 wavelength that is separated height diminishes progressively as to join a ring 1/16 wavelength in diameter.

The upper 1/8 wave joins one of the means of 1/4 wavelength.

Additionally a support mast, which is part of the antenna should be placed on the feeding point, together with the junction between the upper and middle section. It is at this point that connects the shield (mesh) of the coax that feeds power to the antenna. The center of the coax is connected to the end means not connected to the upper element.

Figure 5. Avanti patented antenna

The dimensions of the antenna to be marketed is shown in Figure 6.

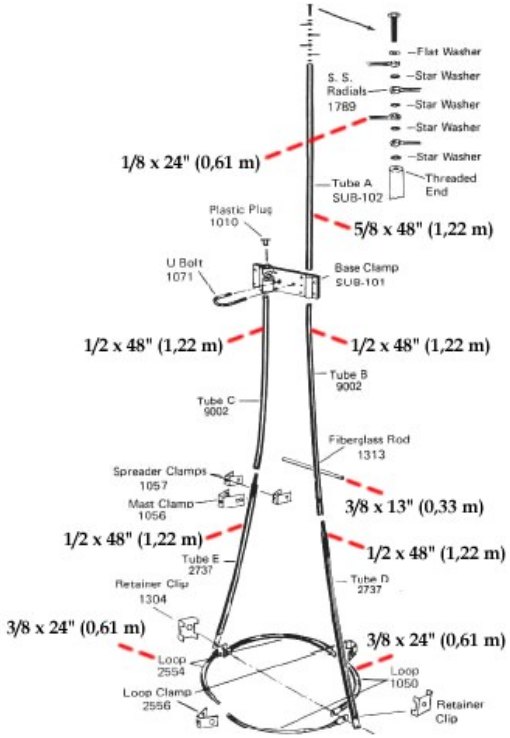


Figure 6. Avanti antenna measures factory Astroplane

We plotted using software Avanti 4nec2 antenna with the dimensions proposed the manufacturer's manual was obtained frequency response shown in Figure 7.

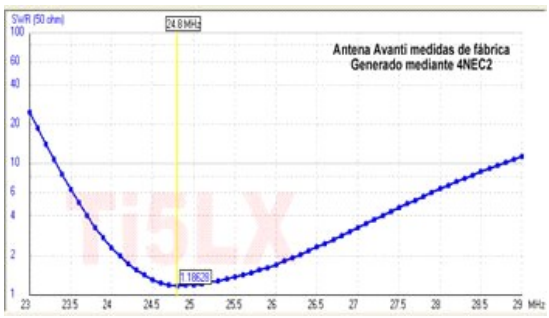


Figure 7. frequency response of the antenna manufactured Avanti Astroplane

Note that the best response is obtained around 24.8 MHz with an approximate bandwidth VSWR 2, 24.75 to 26.25 MHz, ie about 1.5 MHz

It should be noted that while the digital model we have implemented measures of the items listed in the owner's manual, the truth is that in reality the dimensions are slightly lower for the fact that connecting each of them loses a bit of its length.

Under this outcome, indeed unsatisfactory, because the frequency is centered outside our band of interest (27.4 MHz) have undertaken to optimize the dimensions.

The frequency response of the optimized dimensions shown in Figure 8.

Figure 8. Frequency response of elements with dimensions optimized

It shows a response centered at 27.5 MHz with a bandwidth of VSWR of 1.5 at 1 MHz With a VSWR of 2 the bandwidth is about 1.5 MHz

The owner's manual says that the antenna has full coverage in the 40 CB channels and so our Avanti Astroplane 1VSWR optmizada to 1.5, covers 26.8 to 27.9 MHz

Can you change the bandwidth?

The answer is YES.

You can change the bandwidth of the Avanti Astroplane. The antenna Avanti Astroplane respond in a frequency range higher in proportion to alarge element holding the cross, which I call top element.

If the top element is bigger then continued imposition of the antenna to resonance, the cross should be smaller.

Remember that the cross is simply a mirror to complete the electrical quarter wave should be the top item. SI extiede reaching the upper quarter wave, then the cross disappears.

And this is where I would further simplification, if you suppress the cross, by the elongation of the top up to 1/4 wave antenna J then we have a 1/2 wave with a circular element in the base.

Setting the Avanti Astroplane:

We found that by adjusting the size of the cross is set the resonance frequency, as expected.

Some colleagues have raised, but did not try it, this can also be achieved by telescoping the upper element to change its size and therefore its resonant frequency without changing the size of the cross.

Furthermore, when adjusting the resonance frequency indicated by the process also changes the impedance, so that the adjustment should be completed by opening or closing the elements of the middle section. This is achieved very easily if there is the insulating spacer of the middle section upwards or downwards. See Figure 6, there the insulator is called "fiberglass rod".

You need to clarify something, there are two parameters that deal if you decide to build this antenna, one is the impedance and the other is the resonance.

An antenna is resonant when its dimensions are related to multiples or fractions of a wavelength. When this occurs, the antenna is able to capture most signals when their size is such that it is in resonance.

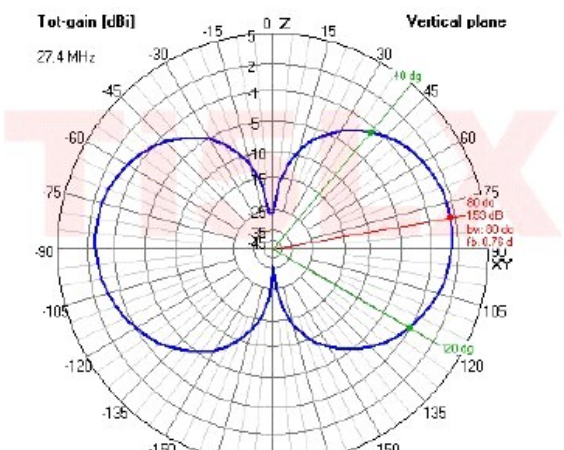
The antennas operate more efficiently then the extent that their size is related to the wavelength, either by multiples or submultiples.

Now, Avanti and generally any antenna may be in resonance, but its impedance be incorrect. If this occurs will see that the antenna responds well in a frequency range including the stationary tend to lower the resonance frequency, but will not fall enough. This is the case with colleagues who encounter cases where the antenna could not lose eg 2.0 VSWR.

In the case of the antenna Avanti, if adjusting the length of the cross elements or upper element, you get a "dip" (minimum) of stationary center frequency around which want to cover the range, then tries to adjust the separation of the two media elements by adjusting upwards or downwards the insulating spacer element, this also affects the impedance and resonant frequency, but then can return to the adjustment of the upper cross member or to recover the desired frequency.

Irradiation patterns

Figure 9 shows the vertical radiation pattern of the antenna Avanti Astroplane in free space. Figure 10 shows the same graph, as filed by the inventor to apply for a patent.



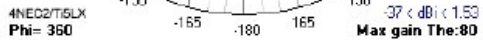


Figure 9. Antenna radiation pattern Avanti vertical Astroplane

The simulation shows a peak gain of 1.53 dBi in the direction of 10 degrees above the horizon (80 degrees in the graph of figure 9) in the release space.

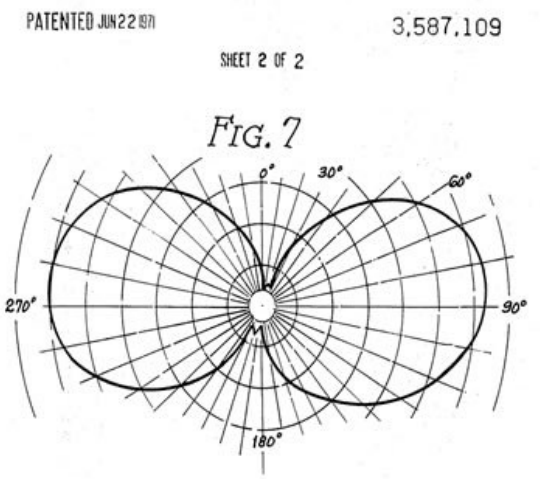


Figure 10.Patrón Avanti Vertical Antenna Astroplane irradiation (Patent)

Figure 11 shows the vertical pattern in the presence of an actual ground, note the maximum irradiation angle of 0 degrees to the horizontal and a gain of 12.7 dBi.

Under the "owner's manual" for this antenna, the AV101 model, indicates you have a gain of 4.46 dBi. But remember that means dBi gain with respect to isotropic irradiator, a nonexistent antenna (theoretical) used to mathematically determine the antenna gain.

A half-wave dipole antenna is 2.15 dBi, what is known as 0 dBd. So Astroplane Avanti antenna is 4.46 - 2.15 = 2.31 dBd. Or what is the same, has a gain Astroplane Avanti actual manufacturer under 2.31 dB over a dipole.

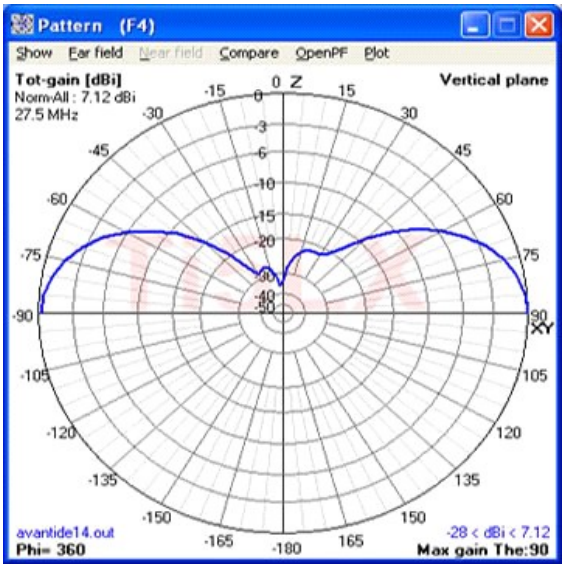
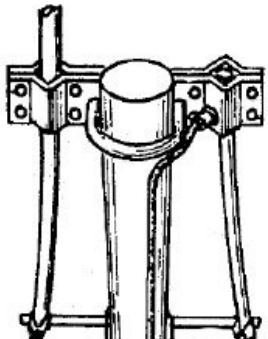


Figure 11. Avanti Astroplane on royal land

But Figure 11 shows a simulation result gain of 7.12 dBi digital, ie is a gain of 7.12-2.15 = 4.97 dBd. This coincides with the proposal of the manufacturer.

The power supply (Connecting you coaxial cable to the antenna)

In the patented design Martino (see patent reference) is fed into the power element short. See figure 12.



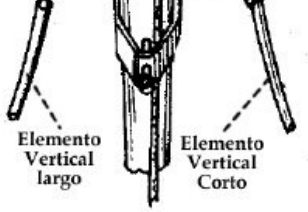


Figure 12. Feeding power

As seen in Figure 12, are installed at two metal sheets screwed to one another, embrace the antenna tubes. As shown in Figure 13 brass clamp (orange in the figure) is welded at the center of the connector PL. This bracket is C-shaped, ie it is a cylinder having a groove on one side, so when the rubber blocks which are pressed by the pressing sheet metal is brass clamp, binds strongly to aluminum stub.

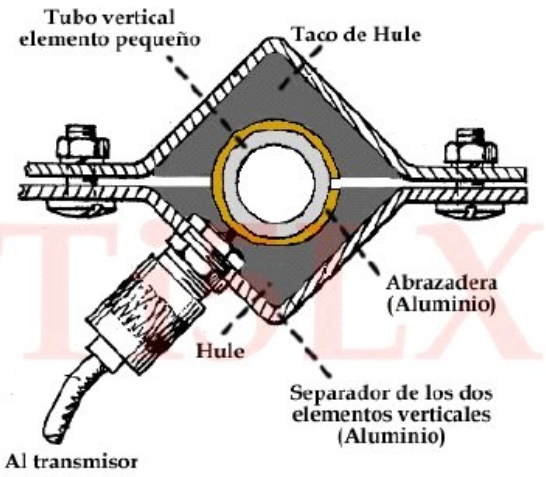


Figure 13. Detail of the power supply

An Avanti for 2 meters

Using the measures provided by the calculation program located in the antenna section of this page (see Figure 14) was constructed Astroplane Avanti antenna for 2 meters, centered at 146 MHz The finished antenna shown in Figures 15, 16 and 17.

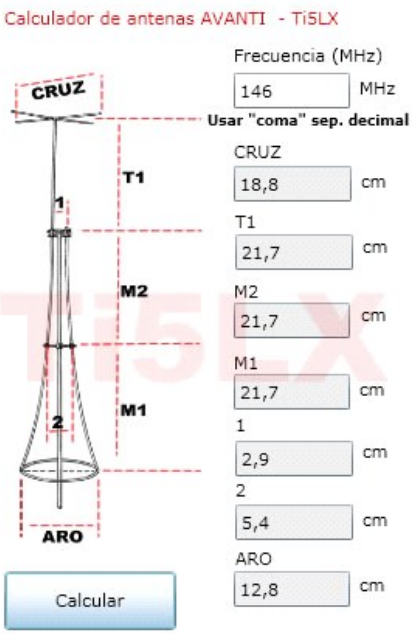


Figure 14. Avanti antenna for 2 meters "Avanti antennas calculator"

This program was developed using Microsoft Silverlight technology to be implemented directly in the browser without downloading. For this reason, requires installed in your browser component free Microsoft "Silverlight". If you do not know if you have it installed or not, simply go to the calculator page, if necessary instalr the Microsoft, an icon that will guide DIRECTLY from the Microsoft server.

Figure 15. Avanti antenna for 2 meters

Figure 16. Antenna installed at 2 meters above the ground

Figure 17. Power supply in the prototype of 2 meters

The input impedance

Astroplane Avanti antenna has an input impedance of about 60 ohms, as shown in Figure 18 for the case in modeling 4nec2 27 MHz.

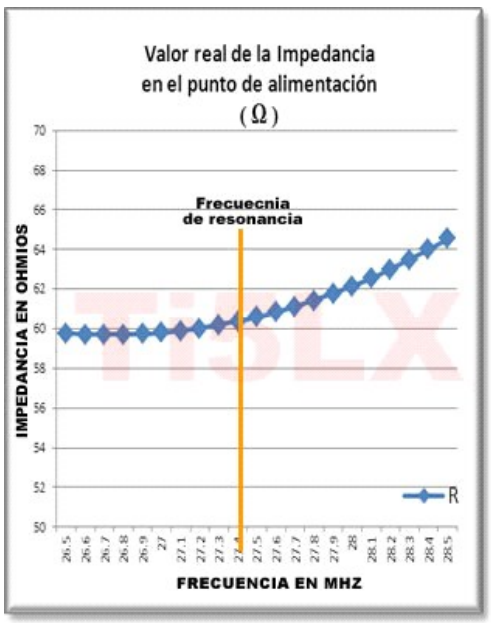


Figure 18. Real part of the impedance of an antenna Avanti Astroplane

The avanti "antenna deaf?"

As I stated above, avanti has two operation modes, one in which the impedance of the antenna feed point is close to 50 ohms (which can be achieved by opening or closing means of the antenna elements "dress the dancer "), ie in which the VSWR is low and the other, in which the antenna is in resonance or not (that is achieved with the size of the cross or" top load ")

The avanti not necessarily be in resonance for low VSWR!, And ANY this antenna is in resonance when its dimensions are related to multiples or fractions of the wavelength, only in these conditions produces maximum power transfer waves traversing the antenna to the receiver.

Put another way, our thesis is that an antenna is more efficient, or "hears" inasmuch as it is in resonance. Ie repeat, in so far as its dimensions are related to a multiple or submultiple of a wavelength. And remember that the wavelength in the aluminum or copper is not the same as in air, something called speed factor, ie because the wave travels slower in other material, in relation to its speed in air. But also remember that all elements tip ending in a phenomenon manifests shortening for radio waves in relation to the wavelength, which is known as edge effect.

So 300 divided by the frequency in MHz is a wavelength in air, but not necessarily in an aluminum tube or a copper wire.

Furthermore, some colleagues do not take into account that the diameter of the elements has a direct relationship with the end result, because the physical dimensions change in the antenna, all this analysis is given diameters referred to by the inventor of the antenna, which shown in Figure 6. Therefore, a recommendation: If you manufacture an antenna for another frequency Avanti (other than the band of 11 meters) take into account the transfer tube diameters in the proportion stored in the pattern shown in Figure 6 for the 11 meter band.

A few days ago Ti2MAB joked, Mario and T4VZ Victor in regard to good theory, could be transmitted using an antenna in which the bed rests, "the metal bed" as we say the Ticos, if using a suitable coupling that transforms the impedance of "cot" to 50 ohms. But that does not mean it would be an efficient transmission system. But watch out, it could also be argued that "the cots do not work as antennas that are very poor," actually, oddly humorous, if fitted properly and similar measures are resonant, its efficiency would certainly enviable :)

Therefore, it seems unfair that some colleagues, with many experience but little knowledge, avanti claim that the antenna is deaf.

I have to confess that I built Avanti antenna to test the calculator avanti antennas described above, gave me such good results, it is my job to regularly communicated on 2 meters, and do not consider ANYTHING DEAF.

Lightning Safety

Astroplane Avanti antenna is an antenna that has all the grounded structure, and which offers a considerable advantage in terms of security on other antennas that operate in isolation, such as the antenna ground plane, "umbrella" or "leg de gallo ", in which the vertical element, the most exposed to the thunderstorm, is isolated from ground and is directly connected to your computer, in your home ..

One final note: Is the Avanti Astroplane the best antenna?

The answer is a resounding no, the best antenna there.

It exists because the term "best" is very subjective, what makes you believe in an antenna as "the best" is not necessarily what everyone would. I mean the term has many meanings. One who is interested in the dx can search the best directional antenna, but maybe another directivity considered as a disadvantage because they are interested in the local comunidados, so we attract more omnidierccional antenna.

Even within the same type of antennas, omnidirectional for example, could difererir what features would make the best antenna, if the beam angle low or high; completely grounded structure, the size, the power capacity, etc..

Each antenna has its merits, it is only fair to say, for example, in terms of some specific feature compared to other antenna if your interest is favorable or not. But never generalize. I argue that the Avanti I can Astroplane, in theory has more gain than the Sirius 827. The Avanti is 2.31 dBd and only 1.5 dBd 827 Sirius. The manufacturers say in their user manuals. But a little search on google so can confirm.

I can also state that both antennas being the same height and at the same point, the antenna is reported Astroplane Avanti more signal relative to the Sirius 827 (9 units of Avanti, the Syrian 8 Units 827). But in terms of handling high power as 2 or 3 KW, maybe Sirius is superior.

But why would you buy for more than 100,000 colones lower gain antenna (The Sirius 827) if less than 20,000 to build an Avanti Astroplane (high gain) can not handle 2 KW perhaps, but that does not even account when operating at 5 or 20 watts that has his team (which is the legal limit of course).

Also consider that when you refer to an antenna, you must provide numbers, many esteemed colleagues used as the sole argument for some antennas, such as the Sirius 827, the trite argument "Install this super antenna and now I will" clear , but what about if not convinced? who gives back to you the most and 100,000 colones you paid for the super antenna?

I do not think either that it is factory antenna is better than another type home. The antennas follow mechanical and electrical principles which can satisfy both the amateur as professional buildings in factories. Do not fall into the trap of many traders who just want to sell, after all, what is ham radio but experimentation?

. Collaborations in creating this article

My thanks to Ti5WLR, Wilberth and Ti2UNA, Gerardo for his help and advice in connection with this antenna.

So our thanks to Henry, "Renegade" San Isidro de Grecia, Costa Rica, experimentation and comparative testing of Avanti Astroplane of 2.31 dBd (described here) with the Sirius antenna 827, which was evident in the practice, the superiority in signal reported already in theory offers the Avanti Astroplane on that just 1.5 dBd antenna.

Comments and inquiries:

If you want to share your comments, photo or experience with this antenna send an email to fran@revistaqso.com, we would appreciate it.

References:

1. Google patents website.

2. 26 alpha tango UK site (pdf)

3. Huang Yi / Kevin Boyle. Antennas from theory to practice. Editorial Willey. United Kindom 2008.

4. The ARRL Antenna Book. 19th Edition. ARRL CT, USA. 2000.

5. Edmund Laport. Antennas Engineering. McGraw Hill. Buenos Aires, Argentina.1963.

6.Digital Antenna Modeling 4Nec2.

Files available for download:

1. Model created by Ti5LX ASTROPLANE AVANTI antenna for 4nec2 software (download requires 4nec2).