The Pennant antenna

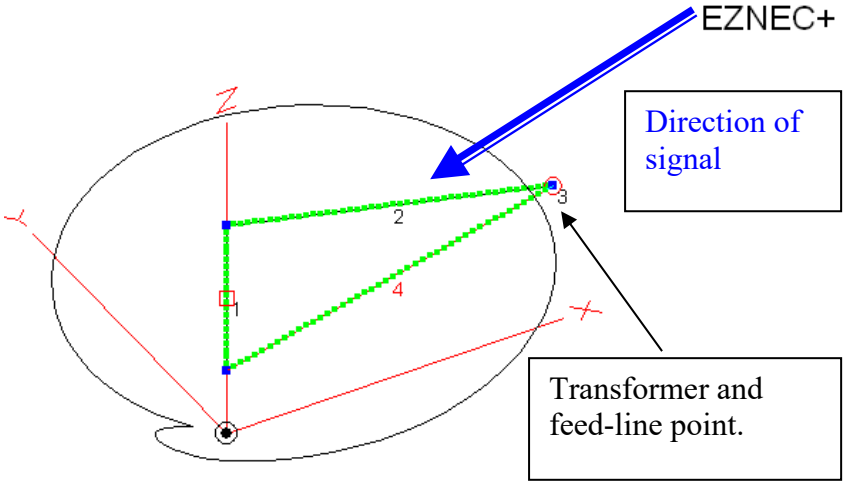
by Pierluigi "Luis" Mansutti IV3PRK

The Pennant is a receiving antenna belonging to the loop family, together with the Flag, Delta, K9AY, EWE etc., whose operation is based on the principle of two small end-fire verticals fed by the horizontal sides. The main feature, which makes me prefer Flag, Delta and Pennants to the EWE and K9AY loops, is their "independence" from the ground, to which there is no connection.

I made several Pennants many years ago, following an article by Earl Cunningham, K6SE, that appeared on *QST Magazine in July 2000* and since then, despite having experimented and still using several other antennas for receiving on 160 meters, in 90% of cases they give me the best results.

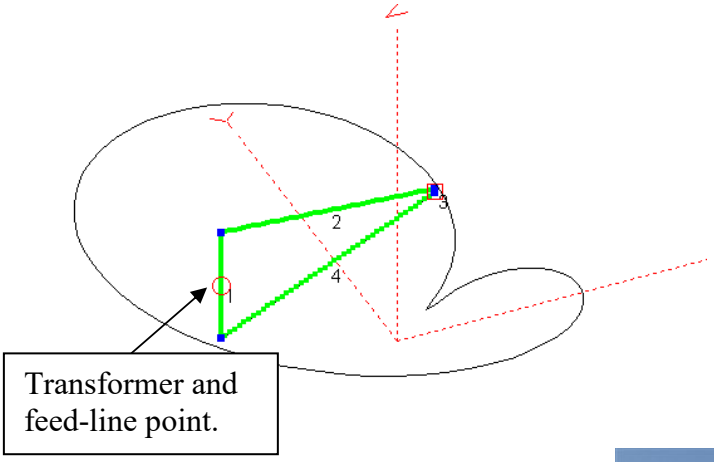
I am using them in groups of three, switchable individually or in pairs, in broad-side configuration at 90 m. distance, as documented in the pdf "Pennants revisited" downloadable from my website, where you can find also a complex study with Eznec (26 pages) regarding these antennas and their interactions with all other wires around.

These are the simple basic information for the construction of a single Pennant:
The antenna is made of normal insulated wire for electrical systems with a total length of 22.50 m. This dimension is not critical, it can vary more or less, but it is good to maintain the same ratios between the sides. The supports are made of two 3-meter wooden poles (tree supports) at 9 m. distance. On one of them, a 5 m fiberglass rod is tied to support the vertical side of the triangle (wire no. 1 of 4.26 m. length) whose lower point is almost 2 m from the ground.



Wires no. 2 and 4 are 9.12 m long and join the power supply point (wire no. 3) at a height of about 4 meters where the transformer is located.
In the middle of the vertical side (point no. 1), the load resistance of about 900 ohms is placed. This is the "null" of the antenna and therefore the signal arrives from the feeding point side.
(I use 4 "non-inductive" 220-ohm 1 watt carbon resistors in series)

In this case the Pennant is said to be "point fed", that is, fed to the tip, but nothing prevents the positions of the feeding point and the load resistance from being inverted.



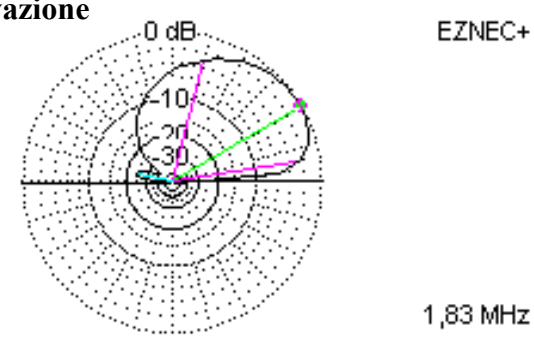
Transformer and feed-line point.

Of course, in this case the lobe of the antenna is also inverted.
However, if you want to converge more Pennants to a switching box, you can do it only from the tip side.

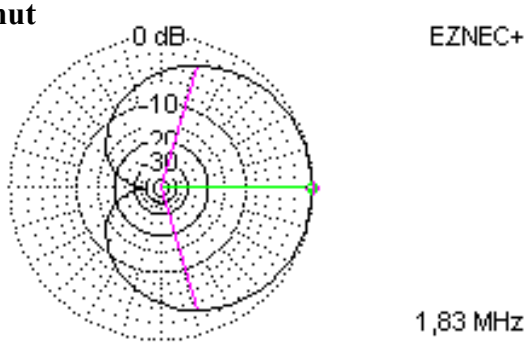
The most important and fundamental aspect for a satisfactory operation of this antenna, as for all the other Rx antennas on 160 meters, is their distance from the transmitting antenna, poles and metal structures, high resonant radials, electric and telephone lines. Everyone tries to do the best possible: in the photo on the side, you can see a Pennant at more than a quarter wave from my TX antenna and facing in the opposite direction. It is therefore necessary to avoid that the noise captured by the Tx antenna be transferred by some coupling to the receiving antenna.

These are the elevation and azimuthal patterns of a Pennant, correctly installed:

Elevazione



Azimut



File			Gain	TO angle	BW	F/B	Avg.gain	RDF
Pennant			- 35,32 dB	30°	147°	37 dB	- 43,11	**7,79**

The resulting lobe is a very wide cardioid, with a very good front/back ratio, although the RDF is not exceptional. The output signal is very low, but with one or two good preamps this is no problem. (At the moment, I'm using a K9AY 10 dB external and a KD9SV internal variable at about 18 dB).

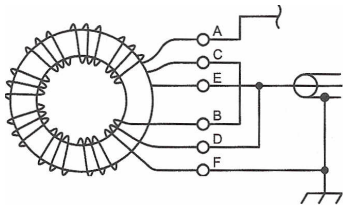
The transformer.

It is the most critical part of the antenna, as in all receiving antennas, and requires the utmost care. The signal available at the output of these antennas, which work with gains of "minus" 30 or

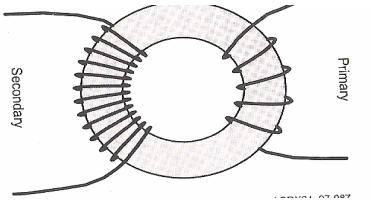
40 dB, is extremely low and must be transferred without further losses and with the greatest possible efficiency. Great care must be taken to isolate the primary from the secondary to prevent the radio frequency (signal and noise) - the "common noise"- received from the shield of coaxial cable – and thus floating on it - from entering the antenna, adding to the desired signal, and then reaching the receiver via the internal conductor of the cable itself.

Over the years there has been a continuous evolution in the experiences in this sector and I myself have changed the type of transformer on receiving antennas at least four times.

Certainly, the types with trifilar or quadrufilar windings have been abandoned to move on to the much simpler ones with two completely separated windings, in which the shield of the coax cable is kept insulated and not connected to the antenna ground (which, in any case, does not exist with the Pennant!).

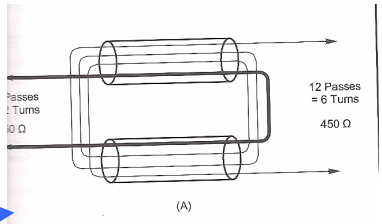


The most suitable materials are the 43, the 77 and especially the 73 in the binocular form.

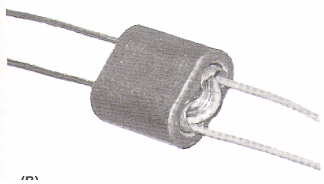


After having obtained good results with:
• FT114-77 toroid: 22 turns on the antenna side and 5 turns at the 50 ohm output

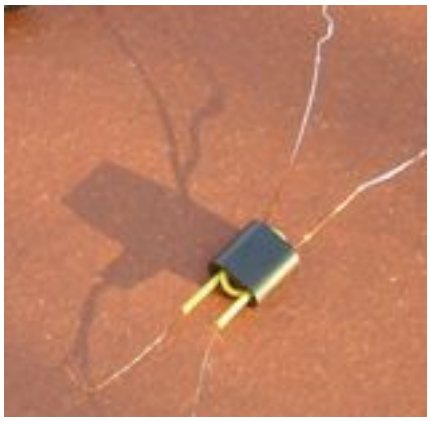
even better with
• FT140-43 toroid: 34 turns on the antenna side and 8 turns at the 50 ohm output, with in series a capacity of 820 pF to cancel the residual reactance (but in this case the antenna only resonates in 160 meters),



I have definitely switched to the
• binocular BN73-202: 12 turns on the antenna side and 3 turns at the 50 ohm output, but even 8 at 2 is fine, if you use wire of a larger diameter.
Just be careful not to force it to avoid damaging the enamel, it is a very easy transformer to make and sure to be successful.



I am using these binoculars everywhere, and unfortunately, I am already out of a second purchase of 12 pieces made directly from Amidon (at a price of 0.80 cents of USD each).



Further details on ferrite materials and transformer calculations can be found in the document “Transformers and chokes for 160 m. receiving antennas” downloadable from my website.

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