

Contents

[The PA0RDT Mini Whip](#)

[How Active Antennas Work](#)

[How the PA0RDT Mini Whip Works](#)

The PA0RDT Mini Whip

This is a picture of the PA0RDT mini whip, an active antenna for the VLF and shortwave bands, together with its power feed unit:



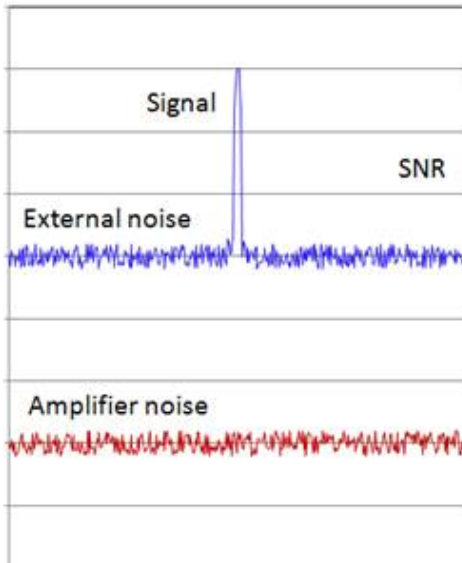
The whole antenna is smaller than a ballpoint pen! How can anybody believe this toy can replace a dipole of full length?!

But yeeees, if we think of the wavelength in the VLF segment and even in the lower shortwave bands – is there a little chance that this antenna works and solves our problems with the landlord being not very enthusiastic about our nice wire entanglements?

Let us look at active antennas and how they work.

Fig. 1: The PA0RDT antenna together with its power feed unit to the right

How Active Antennas Work



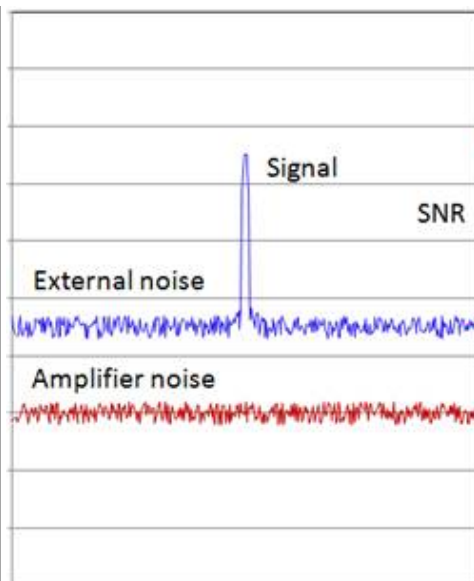
Assume a full-sized antenna picking up a signal and external noise feeding both to a preamplifier stage. The signal to noise ratio (SNR) is determined by the external noise as the noise added by the preamplifier is of much lower level (see Fig. 2).

Fig. 2: A full-sized antenna picking up a signal and external noise

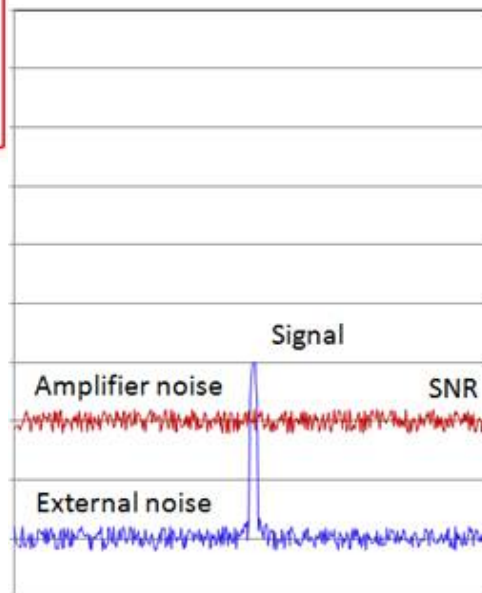
Now think of the antenna to be shortened to a whip of, say, 2 m length and the preamplifier being the amplifier of an active antenna. Because of its reduced length, the antenna achieves a much lower signal strength. But – and this is crucial – the external noise is on a much lower level, too. So the signal to noise ratio (SNR) remains the same (see Fig. 3).

With both antennas, the full-sized one of Fig. 2 and the shortened one of Fig. 3 you can achieve the same sensitivity [1]!

Fig. 3: An active antenna picking up a signal and external noise



For sure, an essential condition for this statement is that both antennas are in the same environment (outside the house). Do not think of the active antenna to be placed beneath your plasma tv because it is so small and then blame it to be of lower performance!



Now we will go a step further to the point, where the active antenna becomes too short (see Fig. 4).

When shortening the antenna again, the level of external noise and

of the signal is decreasing more. At that point, the amplifier's noise level becomes higher than that of the external noise. Now the signal to noise ratio (SNR) is lowered and small signals that could be detected with a longer antenna are now buried in noise [1].

Fig. 4: An active antenna, too short, reducing sensitivity

How the PA0RDT Mini Whip Works

Roelof, PA0RDT, uses a J310 JFET transistor as first amplifier stage of his active antenna [2]. This semiconductor is designed for VHF/UHF amplifiers and adds only low noise to the signal picked up from the antenna. The **external** noise at 30 MHz (upper shortwave band) exceeds 20 dB and at 100 kHz (VLF) the external noise reaches a magnitude of 90 dB [1] in relationship to the thermal noise at standard temperature conditions.

With this low noise semiconductor being the first amplifier stage, Roelof could shorten his antenna to an extent where the external noise still gives a higher voltage than the internal noise produced by the UHF transistor [3]. At that point, the antenna is still performing as depicted in Fig. 3. Roelof has run lots of experiments to prove that the length of the (shortened) antenna does not affect the ratio between the wanted signal and the external noise, in other words: has no impact on the sensitivity of the antenna. Read [Roelof's full report on his experimental results](#).

Compared to other active antennas, the PA0RDT Mini Whip is very small. This is because it has a copper plate in place of a rod acting as antenna. As any other shortened (active) antenna, the PA0RDT Mini Whip is a capacity coupled to the electromagnetic field. The electromagnetic field doesn't care if this capacity is formed as a whip or as a copper plate - it works in both cases. ;-)

When you place this tiny antenna outside the house (!), it will perform like a full-sized antenna for the VLF and shortwave bands. Take advantage of the electric shielding a building provides. Local noise, generated by electric and electronic components belonging to modern life, is attenuated markedly by walls [1, 3]

So put your active antenna **out, out, out** of the house as high as you can! Get it attached to a broomstick and fix it to the window frame!

For more information on the PA0RDT Mini Whip, write an email to **Roelof Bakker, PA0RDT**, roelof+++ndb.demon.nl

[1] [ITU-R: Radio Noise; Recommendation ITU-R P.372; P Series; Radiowave Propagation](#)

[2] [Roelof Bakker, PA0RDT: The PA0RDT-Mini-Whip](#)

[3] [Roelof Bakker, PA0RDT: The PA0RDT-Mini-Whip, an active receiving antenna for 10 kHz to 20 MHz](#)