info@plecso.de
+49 (0) 7631 98 99 35 8

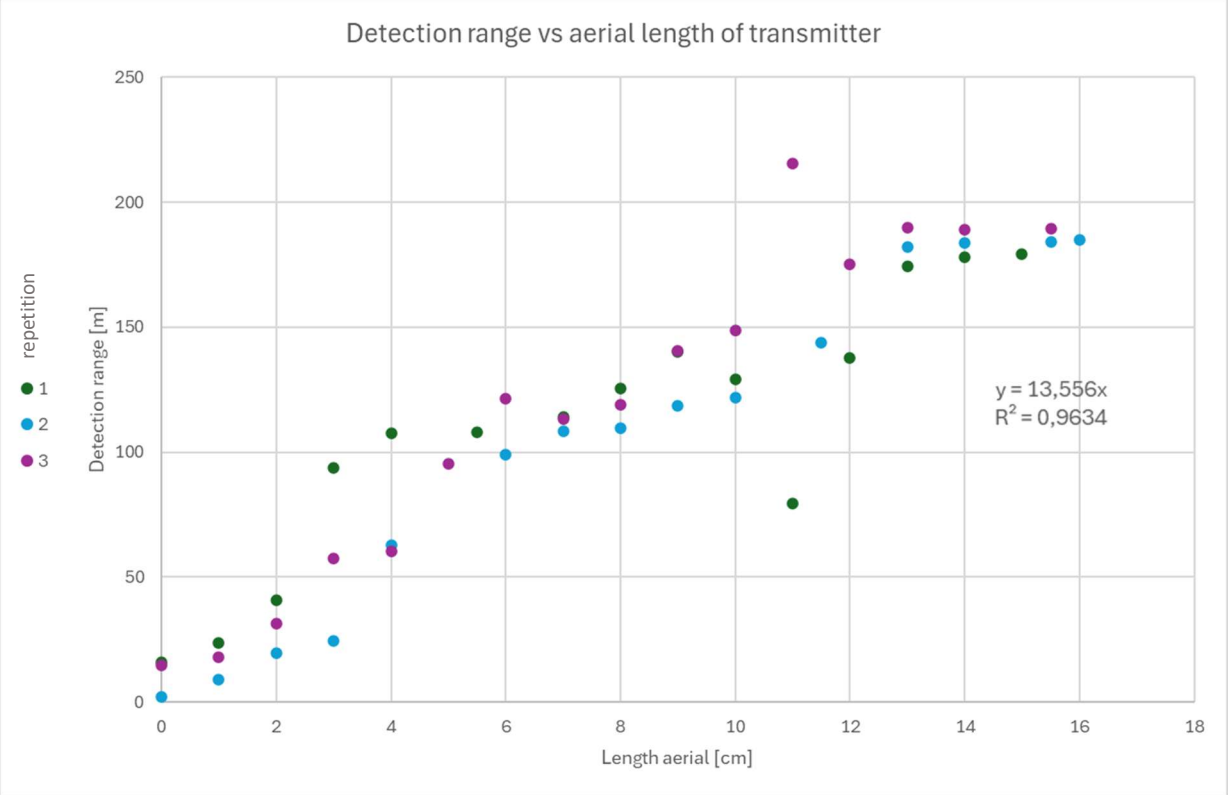
How does the length of the transmitter's aerial affect its detection range?

Conducted by: Plecotus Solutions GmbH | Im Weierle 3 | 79379 Müllheim | Germany | info@plecso.de

In a simple designed outdoor test, we would like to show you how the detection range decreases by shortening the transmitter's aerial. This might be interesting for small animals, which might be affected by the length of the transmitter's aerial like the naked mole rat or long tailed field mouse.

In short: 0,5m underneath the ground, receiver in maximum gain setting, omnidirectional aerial, signal just slightly above the noise floor, 16cm aerial length at the beginning

Results



The pattern is clear – the longer the aerial, the higher the detection range. Keep in mind, that the transmitter was covered by 0,5m of soil. Assuming a linear pattern (simple linear regression model), we lose 13,6 m detection range per cm cut (R^2 = 0,96) in this setup with the transmitter 0,5m underneath the ground.

info@plecso.de
+49 (0) 7631 98 99 35 8

PLECOTUS SOLUTIONS

The Experiment

Material used:

- T1000: adapted Plecotus Solutions Training-Transmitter with 1000 µW transmission power and adjusted aerial, which points upwards for easier cutting and better alignment
- hole in the ground 0,5m deep with a PVC pipe as reinforcement
- special reposition rod
- animal simulation body: 0,5 l water bottle
- AOR DV-10 receiver with the included omnidirectional aerial
- 50m measuring tape

Preparation:

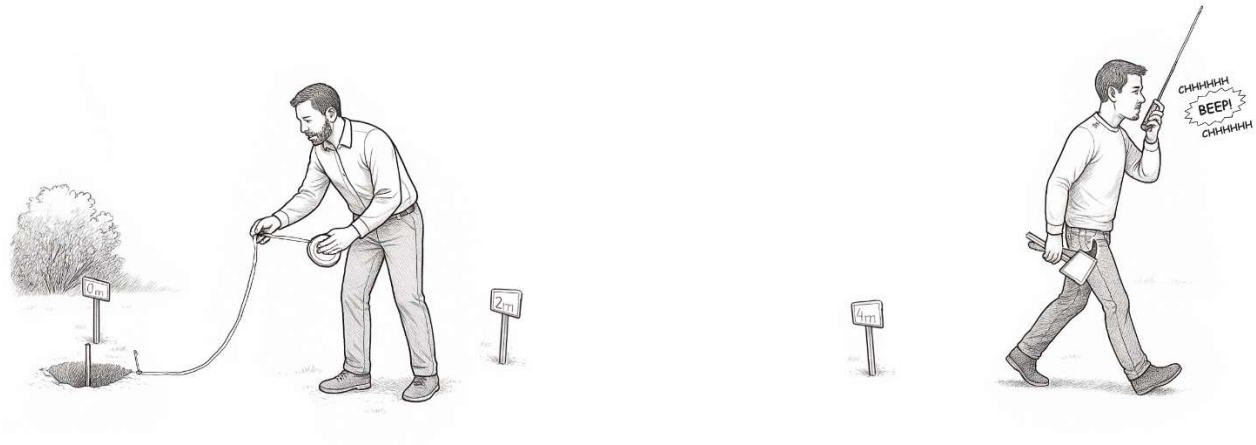
- meadow selection with a homogenous landscape and flat terrain
- drilled ground hole with a PVC pipe as reinforcement
- attach the animal simulation body to Plecotus Solutions Trainings-Transmitter T1000

Steps:

1) Measure length of transmitter's aerial
2) Place it on the reposition rod and lower it into the whole till the bottom
3) Using the receiver with a maximum gain setting, no attenuation and omnidiractional aerial pointing upwards to find the maximum detection range by listining to the signal until it fades into the noise floor
4) Mark position and **measure distance** towards hole
5) Cut aerial by 1cm and repeat

A whole was drilled into an almost flat meadow and reinforced with a PVC pipe so no soil can influence the measurements. As the orientation of the transmitter aerial within the tube and in relation to the water bottle is important, we designed a rod to position the transmitter in the same place each time. The water bottle was needed to simulate the animal's body (electromagnetically). We used the AOR DV-10 Receiver in USB Mode with full gain (setting rf gain 255) and no attenuator. The included omnidirectional arial was fully extended and held upright.

info@plecso.de
+49 (0) 7631 98 99 35 8



First, we walked in a straight line until we lost the signal. Then, we retraced our steps along that line for a few metres until we could hear faint but clear beeps constantly. This was the most difficult part of the experiment and, again, this is just an estimate. This position was marked with a sign indicating the length of the transmitter aerial. We used a tape measure to record the distance from the transmitter's hole to the marked point.

Discussion of results

The experiment clearly shows that cutting the transmitter's aerial – thus shortening it – decreases the detection range. We used an omnidirectional aerial to minimise the influence of the receiving aerial's direction. The experimenter's ear also has an influence. Therefore, the same person was used for all experiments in runs 1 to 3.

Cutting the first few centimetres had little effect, and it was difficult to measure any difference.

Overall, it is possible to shorten the aerial in order to minimise any potential impact on the animal's behaviour and well-being. Ultimately, it is a trade-off between detection range and benefits for the animal.

The physics behind it

Get back to us with some feedback (info@plecso.de) and we are happy to provide you in a follow up whitepaper on the physics behind it.