Miniwhip feeder denoising.

Pa0nhc 20200204. www.pa0nhc.nl

The following de-noising measures were developed together with my version of a “Screened Active RX loop” antenna. They are mostly also valid for an active E-field antenna like the Miniwhip.

However, unlike a loop, at an E-field antenna like the **Miniwhip**, the screening of the PCB antenna surface and the PCB electronics surface against E-field noises is impossible.

My version of the Active Loop Antenna was developed in my *very* noisy location. The nett length of the coax feeder is abt. 25m. This cable runs through my whole house, and over the roof surface of the neighbors below.
All floors, roofs and walls of our complex contain very noisy mains power cables. Nine CMC's were installed over the coax feeder at intervals of abt. 3m.
The results with my screened loop :
If the antenna power supply is switched-***off***, at frequencies lower than 1.6 MHz all very strong noises and signals become **40 dB to 65 dB (!!)** weaker.
Above 1.6 MHz most signals and noises are in my location less strong. When antenna power is off, all noises and nearly all signals vanished into the receiver noise floor (equal to <= -122 dBm with a correctly adjusted software gain for the low outpu loop antenna).
This behavior is a proof of pure *differential mode behavior* of the feeder coax cable, the electronics AND the loop. The coax feeder, the loop electronics and loop antenna then act as purely balanced.

That *loop antenna is NOT grounded*, but due to good construction, it now is *NOT receiving by its feeder,* but only only receiving by its loop.
http://www.pa0nhc.nl/RXloop_PN2222/indexE.htm

The only appropriate de-noising measures for an E-field antenna like the Miniwhip are :
1. **Ground the antenna PCB**,
2. Connect all metal buses at the splitter box in electrical contact with its *outside surface*.
3. Install every 3m good CMC's on the coax transmission line,
4. *Do NOT ground*
   - the splitter box,
   - nor the receiver,
   - nor the feeder.

ONE POINT GROUNDING : only the antenna PCB.

The coax feeder.

If a short (<= 10m) coax feeder is to be used, **use very thin RG316 PTFE coax**.
It is nearly invisible, allows to construct *very* good common mode chokes, and when not to long, shows low enough losses on high frequency bands.

For longer feeder lengths, and if antenna sensitivity on high bands is important, use a thin version (4,8mm) of RG58 coax. This shows less signal losses at high SW bands.
But it enables less turns through the hole of an ferrite core, resulting in less common mode blocking performance per CMC.

Why Common Mode Chokes (CMC's) could be needed on feeders.

½ lambda long feeders cause common mode currents and should be avoided.
See articles by K9YC.
In receiving systems, they result in higher noise levels at certain related frequencies.

- A 20m long feeder shows ½ lambda resonances at multiples of (20m/2) wave length : 10m, 20m, 30m, 40m etc.
- A 15m long feeder shows ½ lambda resonances at multiples of (15m/2) wavelength : 7,5m, 15m, 22,5m, 30m etc.

The possible noise hinder depends therefore on the feeder length, and on the used frequency band.

BUT : The results of installing CMC's on the feeder of a Miniwhip antenna will fully depend on the quality of noise-free grounding of the Miniwhip antenna PCB.

And :

The construction of the splitter. Install :

- Into a fully screening metal box.
- With the PCB grounded at ONE point to the *inside* of the box.
- ALL connectors (including the 12Vdc power bus) must be fully METAL.
- ALL ground contacts of these connectors MUST be in good electrical contact with the OUTSIDE of the box.

Do *you* need CMC's ?

Check the difference in signal levels, when the antenna is powered-off. If you see to little difference, common mode signals and noises on the outside of the feeder possibly do intrude and influence the performance of your Miniwhip antenna system.

Then try installing CMC's on the coax feeder :

- Begin with a CMC directly at the antenna PCB, and another CMC directly at the splitter box.
- Install CMC's in between with distances of maximal 4m.

After that, test with CMC's over the connecting coax between splitter and receiver, and over a connected (THIN !) USB cable.

A good CMC for this project contains a maximal possible number of coax turns through the 18.5 mm hole of a 29mm x 42mm **#31 ferrite** split core (FiarRite “SnapIt” **04 31 17 35 51**).

2,5 mm coax : 11 turns (2m). Zmax >= **4.8 *kOhm.*** =======>>
5 mm coax : 8 turns (1,5m). Zmax only >= 2.6 kOhm.

REM : After winding, the coax should fit *loosely* in the core hole, and both ferrite halves should close perfectly in contact to each other.

CMC wound with RG316 coax.

See also on my site www.pa0nhc.nl :
- **De-noising a linear power supply : http://www.pa0nhc.nl/PowerSupplyDenoising/indexE.htm**
- **De-noising the mains power for your radios : http://www.pa0nhc.nl/NetFilter/indexE.htm**